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PROCEEDINGS  
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American Society  
of  
Civil Engineers

TWO PARTS



PART 1

MARCH, 1927

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SPRING MEETING, ASHEVILLE, N. C.

APRIL 20-22, 1927

ANNUAL CONVENTION, DENVER, COLO.

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# AMERICAN SOCIETY OF CIVIL ENGINEERS

## PROCEEDINGS

VOL. LIII

MARCH, 1927

No. 3

### SOCIETY AFFAIRS

#### STRUCTURAL EXHIBITS AT ANNUAL MEETING

##### First Event of This Sort a Great Success

A new and most successful departure in the conduct of Society meetings was tried at the recent Annual Meeting. This consisted of a series of exhibits depicting many of the recent and advanced methods of design, apparatus, and accomplishments in structural engineering.

Part of the Society Rooms on the 15th Floor was given over to this display. Great interest was evident. At times, the rooms were crowded, and practically continuously throughout the meeting a number of visitors were asking questions, getting advice, or "playing" with the various devices on view.

Those who missed this opportunity at least deserve a brief account. Those who contributed to this exhibit, unique in Society annals, deserve more than a brief acknowledgment—their's, indeed, was a success that placed the Society and all visitors greatly in their debt.

Of these, perhaps, the major credit belongs to Arthur G. Hayden, M. Am. Soc. C. E., and with him the other engineers and officers of the Westchester County Park Commission, who bore the brunt of the preparation for the exhibit.

##### Purpose of the Exhibit

The general idea had a small beginning. A number of inquiries addressed to the Commission regarding the details of, and the experiences with, its new type of rigid frame bridge suggested the idea of

using the time of the Annual Meeting of the Society as an occasion for explaining the method to visiting engineers.

The Engineering Department of Columbia University became interested in aiding this plan and offered to house the necessary apparatus. The University, however, willingly withdrew in favor of a proposal to bring the exhibit directly to the Society Rooms for the benefit of all who might attend the Annual Meeting. The idea was then suggested and adopted that the general content be extended to include any and all of the recent advances in structural methods, as will be seen from the brief description to follow.

This plan attracted the interest and help of numerous engineers and bureaus extending from Boston to Washington, and as far west as Iowa.

##### Westchester County Park Commission

An extensive exhibit with models, plans, photographs, and deformeter apparatus showed the advances made in the design and construction of indeterminate frames, especially those types most adaptable to highway grade crossing elimination. A reinforced concrete solid-section rigid frame with a variable moment of inertia has been developed by Mr. Hayden. Models showed this type and two others, namely, a fixed arch with a minimum rise according to the design methods of C. S. Whitney, M. Am. Soc. C. E., and the usual type of through plate girder bridge. Comparative estimates of the three types showed the rigid frame to be more economical than the beam and girder, and this in turn to be more economical than the fixed arch.

Comparative models of a typical rigid frame bridge and a skew bridge for the same clearances, indicated the forces acting in each instance. The skew structure represented by the model was designed by N. G. Babcock, Assoc. M. Am. Soc. C. E., and Bernard L. Weiner, Jun. Am. Soc. C. E., in collaboration with J. Charles Rathbun, M. Am. Soc. C. E. Three such structures will be built in 1927.

Another set of spline models demonstrated visually the greater external work performed on a simple span structure as compared with a rigid frame. By testing these with a given weight, the deflection of the rigid frame was evidently much less than for the simple span.

#### Electric Telemeter

The Emery-Tatnall Company of Philadelphia, Pa., exhibited the telemeter, an instrument which has been used for various strain measurements, notably in the Stevenson Creek Experimental Arch Dam. This instrument by means of the change in electrical resistance in a stack of carbon disks measures in thousandths of an inch strains which can be read at a central observing station.

The exhibit showed a single element telemeter mounted on a U-frame so that tension and compression could be produced artificially and the amount read on a millimeter. The apparatus also included photographs of various types of apparatus adapted to such uses as measuring strains in elevator cables, in aeroplanes in flight, and vibrations in machine parts.

An interesting exhibit was a section of film showing the reading of six telemeters placed in the Princeton Stadium to indicate the live load and impact due to movements of the crowd.

#### Arlington Memorial Bridge Commission

Through the courtesy of John L. Nagle, Assoc. M. Am. Soc. C. E., several exhibits were on view, relating to the design of the Arlington Memorial Bridge across the Potomac River, Washington, D. C. Three two-dimensional models illustrated the effect of a continuous superstructure on the stiffness of two-hinged, three-hinged, and no-hinged arches. By placing weights on the various models the smaller deflections for the integral structure were apparent. For comparison, stress sheets were given showing the influence lines for the bridge, both with and without superstructure.

Deflection contours showed the deformation of the bridge caused by the weight of the spandrel facing walls. These contours were determined by George E. Beggs, M. Am. Soc. C. E., by tests on a three-dimensional celluloid model.

#### Ohio State Highway Commission

This exhibit also indicated the effect of continuous superstructure on the stresses in arch bridges. The influence lines were determined by experiments on an elastic model of a proposed bridge. The exhibit was provided through the courtesy of D. H. Overman, Assistant Engineer, Ohio State Highway Department.

#### Society Committee on Concrete Arches

W. M. Wilson, M. Am. Soc. C. E., supplied photographs illustrating the methods of tests and the manner of failure of concrete arch ribs. He also showed, by blue prints, apparatus designed for applying a series of equal loads to an arch rib.

C. T. Morris, M. Am. Soc. C. E., used photographs and drawings to indicate the apparatus and results of tests on the flow of concrete.

#### George E. Beggs

George E. Beggs, M. Am. Soc. C. E., had on view a hard rubber, skew arch model, showing the apparatus used and the results of testing. The drawings recorded completely the influence contours for the six reaction components of a 30° skew arch. A similar arch was tested by the U. S. Bureau of Public Roads. Professor Beggs' deformeter apparatus was also used in obtaining results demonstrated by several other exhibitors. Most of these used celluloid models for the experiments. This process has already been explained to members.\*

#### U. S. Bureau of Standards

Dr. L. B. Tuckerman was on hand to demonstrate a number of most interesting and useful machines. His optical strain-gauge with a 2-in. gauge length was so delicate that the visitor could observe the deformation of an ordinary brick bent in the hands. This gauge could be knocked about without disturbing its delicacy. A small portable tester for bricks was exhibited. This worked on the principle of the hydraulic plunger. A device was shown for calibrating test-

\* Transactions, Am. Soc. C. E., Vol. 88 (1925), p. 1208.

ing machines, operating on the basis that a definite load is required to deform a heavy steel-ring.

#### C. M. Spofford

This exhibit showed by lines in colored ink the comparison between exact and approximate methods for calculating the bending moments in a steel building frame due to wind. The values obtained by the analytical method (slope-deflection) agreed closely with those found experimentally by a method using the deformeter apparatus.

#### John T. Windrim

In designing a multiple-arch conveyor bridge for the new Richmond Station of the Philadelphia Electric Company, Mr. Windrim used a celluloid model. The exhibit showed influence curves and photographs, illustrating the practical application of the experiments, and the appearance of the finished structure.

#### A. H. Fuller

This exhibit showed by photographs the set-up of experiments under way at Iowa State College to determine the laws of distribution of concentrated loads in bridge floor-slabs. A series of levers was arranged to show the distribution of the reaction along the edge of a flat slab. Toward the center of the support this reaction increased, being least at the ends, that is, at the corners of the slab.

#### Illinois Central Terminal Improvement

Through the courtesy of D. J. Brumley, M. Am. Soc. C. E., a series of photographs showed the catenary bridges of the railroad, illustrating the method of design, using cardboard models.

#### Photo-Elastic Analysis

Professor Thomas H. Frost gave a demonstration of the determination of stress distribution by the use of polarized light passed through celluloid models. This apparatus enabled the visitor to bend the various celluloid shapes and watch the development of stress as indicated by the various bands of color which were visible through the eye-piece and were caused by the temporary double refraction of the stressed material. These colors shaded gradually according to the actual intensity of stress. Among the interesting applications of the method were shown its use in detecting stresses in gear teeth and in knees as used in various structures. It has also been applied to parts of steam turbines and rigid airships.

#### Demonstrators for Exhibits

Not the least of the value of the whole exhibit resulted from the attendance of men who were thoroughly familiar with, and could demonstrate, the various pieces of apparatus and explain the diagrams, etc. Great credit is due to Mr. Hayden and Mr. Joseph Barnett, of the Westchester County Park Commission; to Dr. L. B. Tuckerman, of the U. S. Bureau of Standards; to Mr. Francis G. Tatnall, of the Emery-Tatnall Company; to Professor George E. Beggs, of Princeton University; and to Professor Thomas H. Frost, of the Massachusetts Institute of Technology.

To say that the exhibit was popular is a very mild statement of truth. No count was made of attendance, but this easily amounted to several hundred from whom widespread favorable comments were heard. The utmost credit is due all those who assisted in making this new venture so justly popular.

#### Makes Advanced Study Possible

##### Columbia University Scholarship a Most Attractive Prize

The American Society of Civil Engineers again announces the offer of an Engineering Scholarship at the School of Mines, Engineering and Chemistry at Columbia University, for the coming year under conditions specially attractive to ambitious students. For the current year there were three applicants. The scholarship was awarded to Joseph J. Domas, Jun. Am. Soc. C. E., who was graduated from the Brooklyn Polytechnic Institute in June, 1926.

Only those who have had three years' work in a recognized college will be eligible. The award will give \$350 per year, with possible renewal for good scholarship. Other things being equal, members of any Student Chapter of the Society will be favored in selection.

The Engineering Courses at Columbia are on a six-year basis, for at least three of which—probably four, for a graduate—the candidate will receive advance credit. In addition to the thorough training, the splendid equipment of the University augments the work, appealing above all to the more mature student.

New York City is, in effect, an immense engineering workshop open to the inquiring mind. In it great buildings, great railroads, great bridges—in fact, great examples of every kind of engineering—find expression. There the



National Engineering Societies have headquarters and hold meetings. Above all, the combined library of these Societies, the largest of its kind, gives every chance for research. Inquiries addressed to the American Society of Civil Engineers, 33 West 39th Street, New York, N. Y., will bring complete information.

## REASONS FOR JOINING THE SOCIETY

### Canvass of 1 000 New Members Enlightening

An inquiry was addressed in November to 1 000 members lately added to the Society, asking what their motives were in joining. Provision was made for noting reasons in the order of their importance, but care was taken to avoid suggesting any particular type of reason to be expected. The results thus constitute a mirror in which the Society may view itself, reflecting the impressions it makes on interested civil engineers, not heretofore members.

The first 500 of the replies received were distributed as follows:

	Joined.	Answers.	Percent- age.
Members and Affiliates joining between June 1, 1925, and November 8, 1926.....	180	69	39
Associate Members joining between November 1, 1925, and November 8, 1926..	388	251	65
Juniors joining between June 1, 1925, and November 8, 1926..	432	180	42
Total .....	1 000	500	50

### Replies Fall into Natural Groups

The replies were found to divide themselves naturally into four main groups, with a relatively few exceptions, which were bulked into a "miscellaneous" item. The most important results are indicated graphically in the subjoined chart.

In general, each of the replies gave three reasons, arranged in the order of their importance. These reasons were most conveniently rated with weights of 3, 2, and 1, respectively, in the order of their indicated value, giving a total number of 2 616 weighted reasons divided as follows:

Publications .....	785
Prestige .....	698
Contacts .....	452
Organization .....	418
All Miscellaneous combined .....	263

### Publications

The publications were considered the most potent reason in that they brought to the members (necessarily to most of them through the mails) technical knowledge on civil engineering matters either as expositions of the latest theories of design, or as reports from committees engaged in research; or as technical problems met and successfully overcome; or, on the other hand, as affording an opportunity for a member either to advance himself by being able to indicate to the profession his technical knowledge on a subject through the medium of a paper or the discussion of a paper, and the more altruistic point of view of being sincerely desirous of benefiting the profession by making use of the publications as a medium for the distribution of any valuable technical fact learned.

### Prestige

This was given as the second most influential reason for joining the Society. The individual answers ranged from clear-cut statements that membership in the Society would enable one to secure a better job or to differentiate one from "quack" engineers, to the opposite point of view of affording a member personal pride in being admitted to affiliation with men felt to practice high ideals and ethical conduct. It was attempted to assign each reason having this general characteristic to one or the other of these attitudes, that is, either for what it brought to one in the way of financial gain or what it brought to one in the way of ethical consciousness, and it was found that about 76% of the replies (weighted) were for the more selfish reason and 24% for the more ethical attitude.

### Contacts

The third major division into which the answers fell has been headed "Contacts", with the intent of expressing the opportunities afforded for an engineer to come into personal contact with the prominent members of the profession. Reasons which fell into this group varied from the extreme of hoping to profit thereby personally in advancement and salary to the other extreme of social

and technical contact with men of like temperament and common experience, more particularly as exemplifying high ethical conduct. The value of these contacts was felt most frequently by the younger men.

#### Organization

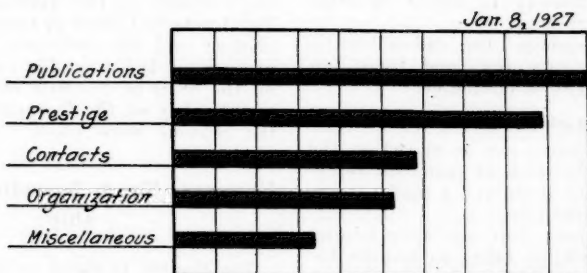
The fourth major division was the desirability of being affiliated with an organization of professional engineers, and the reasons as expressed ranged from a desire that the organization take on

for a vigorous professional Society, or the more passive acceptance of good work well done, and it was found that 43% were in support of the active attitude and 57% of the more passive.

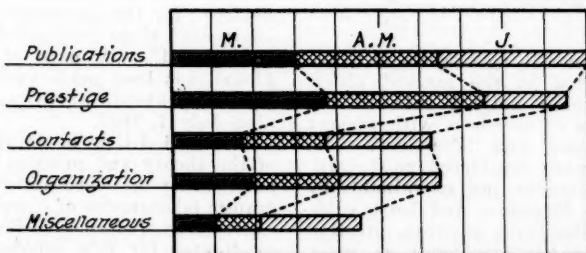
#### Miscellaneous

Under the miscellaneous grouping, as might be expected, there are a number of reasons of quite different characteristics. It was necessary, in the analysis of these miscellaneous reasons, to subdivide the replies among the several

### AMERICAN SOCIETY OF CIVIL ENGINEERS RELATIVE IMPORTANCE OF REASONS FOR JOINING THE SOCIETY



Reasons (Weighted) from 500 Members of All Grades  
Expressed as Percentage of First Choice



Frequency of Reasons from 100 Members from Each of the Several Grades  
Expressed as Percentage of the Most Frequent Reason

a definitely professional character, out of which should grow better financial returns for professional engineers as individuals to the opposite extreme of a desire to support the organized technical society of one's profession, more particularly to give weight to the idealism which it was understood to further. In this case, also, it was attempted to assign each reason having this general characteristic to one or the other of these attitudes, that is, either the desire

grades of membership in order to bring out fully the effect of the several answers. Among the Juniors the most frequently stated miscellaneous reasons were: First, the Employment Service; second, the hope to be of help eventually to professional brothers; third, because of the example and inspiration offered by older members who are acquaintances; fourth, the inspiration to be had from general association with the Society's activities and members; fifth, the Li-

brary; and, sixth, to be in line for advancement to higher grades.

Among the Associate Members, the Employment Service again ranked first among the miscellaneous reasons and was the only outstanding one on which a number agreed. Three other reasons are of interest and were equally supported, but that support was only slight: The Library; the fact of having pledged oneself to the Code of Ethics; and the inspiration expected from affiliation with an organized group of civil engineers having high ideals, etc. One other reason of particular interest advanced by three persons was that they joined in order that they might be in a position to carry on propaganda among the members of the Society in behalf of other worthy enterprises.

Among Members the miscellaneous reasons were very few, and these few widely divergent in character.

#### Geographical Distribution

No special stress can be placed on the geographical location of members replying, except that it showed a fairly representative distribution.

The indications as to age upon joining are rather striking, being as follows for the total list of 1 000:

	Average age.
Members and Affiliates...	45 years
Associate Members.....	35 "
Juniors .....	25 "

This difference in ages seems to be definitely reflected in the marked differences of opinion noticed between the several grades of members with respect to "Publications" and "Prestige". The publications were considered most valuable by the Juniors, not so valuable by the Associate Members, and least valuable by the Members; whereas, prestige was found to be considered as most valuable by the Members, less valuable by Associate Members, and least valuable by the Juniors.

#### Conclusions

It appears that the inquiry has brought out most conclusively marked unanimity on two things for which the Society has always stood. The greatest number of reasons given for joining was "the value of the publications" and only slightly less was "the prestige one acquires with membership", the combined vote on these two features being 57% of all the reasons.

Conclusions as shown by the two other major groups into which practically all

the replies fall are perhaps unexpected: First, the opportunities to meet other engineers, leaders in the profession, socially, principally at the meetings, and as fellow members, either for the purpose of advancement into better positions or for the exchange of technical knowledge; and, second, the value of the Society as an organization for what it can accomplish either ethically for its members and the profession, or, more selfishly, for the advancement of professional status.

The relative importance attached to the several Society features is shown graphically on the accompanying chart. It will be noticed that the same relation among the reasons holds surprisingly closely on two different bases: (a) Total vote weighted in terms of the first choice; and (b) vote per 100 members of each of three grades (not weighted) on the basis of the first choice but computed solely on the frequency with which the reasons were given.

#### Freeman Fund Traveling Scholarship

The Society is about to take on a new activity as sponsor for a traveling scholarship in Europe. This was suggested in 1924 when Past-President John R. Freeman established a fund of the Society "for the encouragement of young engineers", since designated as the "Freeman Fund". A part of the income, \$1 800, has been made available for special study abroad during one year beginning July 1, 1927.

This period is to be devoted to a study of the theory and practice of hydraulics particularly as exemplified in the hydraulic laboratories of Europe, more especially those of Germany. For the present, candidates for this scholarship will be limited to junior professors, instructors, or assistants in American technical schools of recognized standing in which the study of hydraulics forms an important part of the curriculum. A complete statement of the conditions under which the scholarship will be awarded and full details of the requirements may be obtained from the Secretary.

#### Attractive Opportunity

Study in the great engineering colleges of Europe has long been considered a fascinating goal. Some fortunate young teacher is going to find the door suddenly opened for him to attain this opportunity.



with his expenses paid, with the moral support of a great engineering body, and with access accorded to some of the greatest hydraulic laboratories of the world under ideal conditions.

It is suggested that members of the Society give this announcement publicity, either by making personal suggestions to friends or by seeing that the essentials are repeated in college papers or in other mediums where they will come to the attention of those who may best be able to take advantage of the opportunity.

Similar funds for the encouragement of young engineers have been established in the American Society of Mechanical Engineers and the Boston Society of Civil Engineers from the income of which it is expected that similar scholarships will be provided by each of these three Societies, once in three years, so that continuously there will be one such traveling scholarship available. The income from this fund to each of these three Societies amounts to nearly \$1 700 per year.

#### Other Uses of Fund

Plans are now being formulated for utilizing that portion of the income which remains after providing for the scholarship once in three years by the Society, using it for special grants to aid in hydraulic research or for assistance in translating and publishing in English various useful engineering publications in foreign languages.

The first of these publications is to be that of the remarkable book on the hydraulic laboratories of Europe, written by fifteen of the foremost hydraulicians of Germany, Sweden, Russia, Austria, and Czecho-Slovakia, and recently published by the National German Engineering Society, the "Verein deutscher Ingenieure".

#### "BRASS TACKS" ON EXPERT TESTIMONY

##### Valuable Advice to Engineering Witnesses from a Specialist

The subject of expert testimony, a most important matter to engineers, especially consulting engineers, was considered in detail at a recent meeting of the American Institute of Consulting Engineers, on November 15, 1926. Eminent jurists, George W. Wickersham, former Attorney-General, and Judge Charles M. Hough, of the U. S. Circuit Court of Appeals, gave the benefit of their extended experience.

The evening's program was closed by Franklin Nevius, Esq., member of the

firm of Kellogg and Rose, Attorneys, of New York City. Feeling that his remarks would be of great value could they be made available to the membership of the Society, the Secretary, with the permission of the Officers of the American Institute of Consulting Engineers, requested Mr. Nevius to put the substance of his address into brief written form. Mr. Nevius' condensation of his speech, herewith, is worthy of the utmost consideration as a frank piece of advice from a man of special training and long experience in this important phase of Court procedure:

"MY DEAR MR. SEABURY:

"You have asked me to boil down to as brief a space as possible some parts of my little talk before the American Institute of Consulting Engineers recently on the subject of expert testimony. If some of the gentlemen present were kind enough, as you have said, to call my talk 'getting down to brass tacks' on the subject, I am glad that it appealed to them in that way, because that is what I was attempting to do. My discussion was less one of theory and ideals of expert testimony which had already been covered in a most thorough and masterly manner by Judge Hough of the United States Circuit Court of Appeals and former Attorney-General Wickersham, and more an attempt to make a few practical suggestions which might render expert testimony more effective and convincing under the rules and standards which now govern it.

#### Qualifications of Witness

"It is my feeling that it is of the greatest importance, particularly in regard to engineering expert testimony, that the engineer presented as an expert shall state carefully and concisely and without unnecessary verbiage, his qualifications and experience which entitle him to testify as an expert. Such statement of his qualifications and experience must necessarily have very great bearing on the weight which the jury or Court will give to his testimony. It is not always easy for counsel to bring out fully qualifications and experience of an expert, because in an apparent spirit of frankness and desire to save time the opposing counsel will frequently say: 'We concede the qualifications of Mr. So and So.' That concession, to my mind, the Court should be asked to and should disregard, for the reason that very frequently the concession is neither

frank nor for the purpose of saving time, but for the purpose of minimizing the weight to be given to the testimony of the expert. The weight of the testimony of an expert will very largely depend on qualifications and experience, and if they are not stated, then much of the weight of the testimony is lost.

"Judge Hough deprecated the experts assuming the attitude of an advocate and said that he felt that such a stand by the expert prejudices the jury and Court unfavorably. His point, as I understood it, was that over-zealousness of experts going to the length of advocacy would tend to impress the Court and jury that the expert was trying to maintain his point at all costs without sufficient regard for the reasoning or principles of science upon which such testimony was based. I make only one exception to Judge Hough's statement, and that is that where the expert witness has stated an opinion based on careful study of the case as a whole and pertinent to the hypothetical question or questions which may have been asked of him, that it is the duty of that witness, but without undue zeal, to state all the reasons, all the factors, all the elements, that caused him to form that opinion and in every proper way to defend his stated opinion to the same extent, by way of illustration, that a Judge does in supporting his decision of a case by carefully reasoned, logical opinion which sets forth the reasons for such conclusion.

#### Simple Language

"That statement necessarily led to my next point, which was that the expert should state the factors, the elements, and the reasons underlying his opinion as given in clear, concise, simple language with a minimum of technical terms and expressions in order that the jury might understand the reasoning and principles on which the opinion was based. Engineering expert testimony is quite different from the broad general range of expert testimony. Engineering expert testimony is very largely based on principles and laws of engineering, an exact science. It is possible for the engineering expert to make the Court and jury understand the reasons for the opinion which is expressed, and the weight of engineering expert testimony will be very materially increased if the opinion and the underlying reasoning are given, not in the form of dogmatic statements, but with an explanation made as

clearly and simply as possible and in words and terms understandable by the layman, as to why the expert holds and states his opinion.

"What I last stated was directly in line with what Mr. Wickersham said in pointing out, as he did, that the theory of expert testimony was the elucidation and explanation for the benefit of the Court and jury of matters technical and beyond the understanding of the ordinary layman.

"In any case involving engineering expert testimony, the engineer who is to testify should never be satisfied with simply considering those facts which counsel may present to him in the form of an hypothetical question, but should insist on being informed of *all* of the facts which the litigant whom he appears for concedes as existing in the case in order to be sure that the opinion stated shall be one that will not only be a fair and proper answer to the facts of the hypothetical question, but shall be consistent with *all* of the facts which the side of the controversy that he is on concedes and admits. If the engineering expert does so guard himself by having knowledge of all such conceded facts, then having determined that his opinion on the hypothetical question is correct in view of all the facts, he can testify with confidence to his opinions knowing that they are sound, fair, in accordance and consistent with all of the facts in the case, and that he will be in a position to honestly and conscientiously defend those stated opinions in the face of all or any other facts that may be presented for his consideration on cross-examination. In that respect and to that extent under such circumstances, of course, the engineering expert is an advocate. Knowing all of the facts of the case and knowing that his opinions are sound, formed on and consistent with the entire range of facts, he should in an unprejudiced and impartial way defend them and stand ready to demonstrate their accuracy and correctness.

#### Personal Knowledge

"If I may be permitted to trespass on the allotted space a little further, I would add two thoughts for the guidance of the engineering expert: Be sure that your honest conviction is that on the engineering features of the case on which you are called to testify, the opinion which you express is sound and in accord with both your theoretical and empirical knowledge of the subject. Insist on knowing from personal observation of

the matter which is involved in the case in which you are to testify as much as it is possible for you to know of the facts, for the more that the engineering expert knows from personal observation the more convincing will be his evidence on matters of opinion.

"In my talk the other night I approached and now approach the subject accepting as a fact that we have with us difficulties and troubles with the giving of expert testimony. I am well aware that some modification or change of the scheme of expert testimony might be advisable, but until that time comes and that is done, we should do what we can to secure the best results from the giving of expert testimony as we are now limited in presenting it before Courts and juries under existing rules and standards. If I were permitted to give one more piece of advice it would be that those who are interested should by all means secure and read the addresses on the subject made by Judge Hough and Mr. Wickersham.

"Yours very truly,  
"FRANKLIN NEVIUS."

### Research Graduate Assistantships

#### University of Illinois Announces Opportunities

To assist in the conduct of engineering research and to extend and strengthen the field of its graduate work in engineering, the University of Illinois maintains fourteen Research Graduate Assistantships in the Engineering Experiment Station. These assistantships, for each of which there is an annual stipend of \$600 and freedom from all fees except the matriculation and diploma fees, are open to graduates of approved technical schools who are prepared to undertake graduate study in engineering, physics, or applied chemistry.

An appointment to the position of Research Graduate Assistant is made and must be accepted for two consecutive collegiate years of ten months each, at the expiration of which period, if all requirements have been met, the degree of Master of Science will be conferred. The time is to be divided equally between the work in a given Department and graduate study.

Applications for the coming year must be made by April 1, the final choice being based on character, record, and promise. Shortly thereafter, appoint-

ments will be made, to become effective September 1.

The Engineering Experiment Station and the University of Illinois are conducted more or less jointly. Their eminent standing insures that the appointees will receive a high grade of instruction and supervision of research work under the leadership of prominent engineers on the Staff of the University.

Members of Student Chapters or recent graduates may well inquire further as to the possibilities of these assistantships. Address, The Director, Engineering Experiment Station, University of Illinois, Urbana, Ill.

### February Society Meeting

The regular Society meeting, February 2, 1927, after brief announcements by the Secretary, devoted the evening to the consideration of the paper "Storage Required for the Regulation of Stream Flow".

The author, Charles E. Sudler, M. Am. Soc. C. E., explained briefly the purpose of his investigations and the use of his charts for estimating the required storage under various conditions. This new method is really an extension of that originally formulated by Allen Hazen, M. Am. Soc. C. E. It seemed to be the consensus of opinion at the meeting that thus a means had been developed of reducing the work required for these rather tedious hydraulic computations, at the same time improving the accuracy.

Following Mr. Sudler's talk with lantern slides, a number of members discussed the paper, in most cases without going into the technical details of the rather theoretical method. These discussors included Messrs. R. W. Armstrong, W. W. Brush, H. Alden Foster, J. P. Hogan, A. E. Steere, and R. H. Gould. A written discussion from Mr. Allen Hazen was presented by the Secretary.

The attendance was 90. Charles Gilman, M. Am. Soc. C. E., presided.

### Annual Business Meeting of the Society

The Seventy-fourth Annual Meeting of the Society was called to order at 10:15 A. M., President George S. Davison presiding.

Tellers were appointed to canvass the ballot for Officers, and the reports of the Board of Direction,\* and of the Secretary† and Treasurer,‡ were presented.

\* See Society Affairs, p. 74.

† Loc. cit., p. 92.

‡ Loc. cit., p. 96.



Medals and prizes for papers were awarded as follows: Norman Medal to Julian Hinds, M. Am. Soc. C. C.; the J. James R. Croes Medal to Clarence S. Jarvis, M. Am. Soc. C. E.; the Thomas Fitch Rowland Prize to Nicholas S. Hill, Jr., M. Am. Soc. C. E.; the James Laurie Prize to Lewis A. Perry, Assoc. M. Am. Soc. C. E.; the Arthur M. Wellington Prize to Charles W. Kutz, Col., Corps of Engineers, U. S. A., M. Am. Soc. C. E., and the Collingwood Prize for Juniors to Cecil Vivian von Abo, Jun. Am. Soc. C. E.

The reports\* of the Committee on Referred Amendments relative to the proposed amendment to Article VII of the Constitution ("Nomination and Election of Officers") was read by the Secretary, and the Substitute Amendment† presented by the Committee was ordered to letter-ballot, with the recommendation of the meeting that it be adopted. The report‡ of the Committee on Columbia University Scholarship was submitted and accepted.

After announcements in regard to meetings, etc., the report§ of the Tellers on the canvass of ballots for Officers was presented. Retiring President Davison appointed Past-Presidents Clemens Herschel and George H. Pegram to escort the new President, John F. Stevens, to the chair. Mr. Davison then presented President Stevens to the meeting and, in a brief address, Mr. Stevens expressed his appreciation of the honor conferred on him by the members of the Society.

After recess for luncheon, the afternoon session was called to order at 2:40 p. m., with President Stevens in the Chair, for the presentation of reports of Special Committees. The progress report|| of the Special Committee on Concrete and Reinforced Concrete Arches was presented by the Chairman, Clyde T. Morris, M. Am. Soc. C. E., and the subject was discussed by George E. Beggs, M. Am. Soc. C. E., who illustrated his remarks with lantern slides. N. C. Grover, M. Am. Soc. C. E., Chairman of the Special Committee on Flood Protection Data, in presenting the progress report|| of that Committee, dis-

cussed the past, present, and future work of the Committee, using lantern slides to illustrate his remarks. The subject was also discussed by C. S. Jarvis, M. Am. Soc. C. E. The progress report of the Special Committee on Steel Column Research was presented by F. E. Turneure, M. Am. Soc. C. E., Chairman, during which he discussed some small scale tests of columns made by the Committee during the year, also illustrating his remarks with lantern slides. In the absence of A. H. Fuller, M. Am. Soc. C. E., Chairman of the Special Committee on Impact in Highway Bridges, the progress report\*\* of the Committee was submitted by Professor Turneure, following which the reports of several other Special Committees were read by title, including those on Irrigation Hydraulics,†† D. C. Henny, M. Am. Soc. C. E., Chairman; Bearing Value of Soils for Foundations, etc.,‡‡ Robert A. Cummings, M. Am. Soc. C. E., Chairman; Stresses in Railroad Track, A. N. Talbot, Past-President and Hon. M. Am. Soc. C. E., Chairman; Standard Construction Contracts, J. S. Langthorn, M. Am. Soc. C. E., Chairman; Electrification of Steam Railways Charles F. Loweth, Past-President, M. Am. Soc. C. E., Chairman; Hydraulics Phenomena, S. M. Woodward, M. Am. Soc. C. E., Chairman; Effects of Earthquakes on Engineering Structures, J. D. Galloway, M. Am. Soc. C. E., Chairman; Cement, Thaddeus Merriman, M. Am. Soc. C. E., Chairman; and Engineering Contract Bonding, H. G. Shirley, M. Am. Soc. C. E., Chairman.

Henry B. Seaman, M. Am. Soc. C. E., Chairman of the Special Committee on Bridge Design and Construction, outlined briefly the work of that Committee to date, including the report§§ of the Joint Committee on Specifications for Steel Railway Bridges of which he is Vice-Chairman, following which an abstract of the progress report of the Special Committee on Arbitration||| was presented. All these reports were received and referred to the Board of Direction for action.

\* *Proceedings*, Am. Soc. C. E., December, 1926, *Society Affairs*, p. 489.

† *Loc. cit.*, p. 490.

‡ See *Society Affairs*, p. 57.

§ *Proceedings*, Am. Soc. C. E., February, 1927, *Society Affairs*, p. 35.

|| See *Society Affairs*, p. 109.

† *Loc. cit.*, p. 116.

\*\* *Loc. cit.*, p. 120.

†† *Loc. cit.*, p. 121.

‡‡ *Loc. cit.*, p. 134.

§§ *Loc. cit.*, p. 135.

||| *Loc. cit.*, p. 138.

The presentation of Committee reports was followed by the showing of a motion picture film by H. W. Dennis, M. Am. Soc. C. E., illustrating the progress of the investigation into the action of arch dams being conducted by Engineering Foundation on the Stevenson Creek Test Dam in California. John R. Freeman, Past-President, Am. Soc. C. E., described the development of Hydraulic Laboratories in Europe, and presented a film showing a scale model of a rock-fill dam made and tested in the laboratory of the Public Works of Czecho-Slovakia, at Prague. After a few announcements relative to meetings, etc., the meeting was adjourned.

### Meeting of the City Planning Division

The meeting of the City Planning Division which was held at the Engineering Societies Building, New York, N. Y., on January 20, 1927, was called to order by Chairman Morris Knowles at 9:30 A. M.

The Secretary announced the election of the new Executive Committee, as follows: Messrs. Harland Bartholomew, Stephen Child, W. W. DeBerard, Morris Knowles, and Charles Wellford Leavitt.

A paper by Ernest J. Russell, Chairman, St. Louis City Planning Commission, St. Louis, Mo., entitled "Relationship of Architecture to City Planning", was read by Secretary Ball, who also read a discussion of the subject by Frank E. Wetherill, Esq., of the City Planning Commission, Des Moines, Iowa. The subject was also discussed by Messrs. A. P. Greensfelder, C. E. Smith, Rudolph P. Miller, Ernest J. Russell, and Frederick Bigger. A written discussion received from Henry A. Foeller, Secretary, City Plan Commission, Green Bay, Wis., was read by Secretary Ball. Charles Wellford Leavitt, M. Am. Soc. C. E., also addressed the meeting briefly on the subject.

A paper by C. A. B. Halverson, Designing Engineer, Street Lighting Department, General Electric Company, West Lynn, Mass., entitled "Consideration of Street Lighting in City Planning", was presented by the author, who illustrated his remarks with lantern slides, models, apparatus, etc. Discussion on the subject was opened by Mr. Charles Wellford Leavitt, followed by Messrs. Bassett Jones, William Goldsmith, C. J. Stahl, L. L. Tribus, Harold M. Lewis, and L. A. S. Wood.

### Construction Division Holds Meeting

The meeting of the Construction Division was called to order at the Engineering Societies Building, New York, N. Y., on January 20, 1927, at 2:15 P. M., Chairman W. J. Barney presiding.

After reviewing the work of the Construction Division during the year, Chairman Barney introduced President John F. Stevens, who addressed the meeting briefly. Mr. Barney also announced the election of the following as the Executive Committee of the Division for 1927: Messrs. W. J. Barney, A. C. Everham, Harrison W. Latta, J. P. H. Perry, and J. E. Sirrine.

Mr. Barney then introduced H. J. Hughes, M. Am. Soc. C. E., Dean of the Engineering School at Harvard University, who took the Chair. Discussion on the Symposium on "What Should Be Done to Promote Real Co-Operation, Between the Construction Industry and the Engineering College", was opened by A. P. Greensfelder, M. Am. Soc. C. E., who spoke on "What Does the Construction Industry Expect of the Engineering College"? The subject was also discussed by Messrs. Charles R. Gow and Charles M. Spofford. In the absence of the author, a paper entitled "What Does the Engineering College Expect of the Construction Industry", by Anson Marston, M. Am. Soc. C. E., was read by Chairman Hughes, and the subject was also discussed by Messrs. Henry S. Jacoby, L. C. Wason, W. E. Wickenden, T. Kennard Thomson, Theodore Crane, John F. O'Rourke, W. J. Barney, W. K. Hatt, and Milo S. Ketchum.

### Highway Division Meeting

The Highway Division met at 2:30 P. M., at the Engineering Societies Building, New York, N. Y., on January 20, 1927. The meeting was called to order by Chairman C. D. Curtis who announced the election of the Executive Committee for 1927, as follows: Messrs. H. K. Bishop, H. Eltinge Breed, A. N. Johnson, Paul D. Sargent, and S. B. Slack.

A Symposium on "Traffic Control on City Streets", was opened by M. O. Eldridge, Assoc. M. Am. Soc. C. E., Director of Traffic, District of Columbia, Washington, D. C., who presented a paper on "Traffic Control by Electric Signal Lights". Mr. Eldridge was followed by Philip D. Hoyt, Chairman, Traffic Board, Police Department, New York, N. Y., who

discussed the traffic problem in New York City from the viewpoint of the Police Department. The subject was also discussed by Messrs. E. P. Goodrich, L. J. Carmalt, Charles Rufus Harte, Louis L. Brown, Russell S. Wise, and W. W. Crosby.

Discussion on the subject of "Snow Removal from City Streets" was opened by a paper by Alfred Taylor, Commissioner of Street Cleaning, New York, N. Y., on "Snow Removal from New York Streets". In the absence of Mr. Taylor the paper was presented by Elmer C. Goodwin, Examining Engineer, Department of Street Cleaning, New York, N. Y. A paper entitled "Snow Removal from Boston Streets", by Edward F. Murphy, Deputy Commissioner of Public Works, Boston, Mass., was read by W. H. Barton, Jr., Assoc. M. Am. Soc. C. E., Assistant Professor of Highway Engineering, University of Pennsylvania, Philadelphia, Pa. A general discussion of the subject followed, participated in by Messrs. Frank White, William Goldsmith, and R. A. MacGregor.

### Meeting of Power Division

The meeting of the Power Division was called to order at 10:00 A. M., January 20, 1927, at the Engineering Societies Building, New York, N. Y., Chairman F. W. Scheidenhelm presiding.

A paper by Ira W. McConnell, M. Am. Soc. C. E., entitled "The Role of the Civil Engineer in Power Development and Distribution", was presented by the author and illustrated with lantern slides. Discussion on the subject was opened by Peter Junkersfeld, M. Am. Soc. C. E., followed by Messrs. George A. Orrok, Joel D. Justin, Arthur Surveyer, Charles Rufus Harte, and F. W. Scheidenhelm.

After brief reports on the work of the Committees of the Division on Ice and Silting, the work of Engineering Foundation on the Stevenson Creek Arch Dam was discussed and a resolution authorizing the Executive Committee to contribute \$500 toward that investigation was adopted.

Chairman Scheidenhelm announced the names of the Executive Committee for 1927, as follows: Messrs. E. H. Sargent, Chairman, N. C. Grover, I. W. McConnell, E. W. Maloney, and A. H. Markwart.

### Sanitary Engineering Division Meeting

At the time of the Annual Meeting of the Society on January 20, 1927, the Sanitary Engineering Division held a

meeting in the Engineering Societies Building New York, N. Y., John H. Gregory in the Chair.

Chairman Gregory read the report of the Tellers on the ballot for the Executive Committee, the following members being elected for 1927: Messrs. C. G. Gillespie, Samuel A. Greeley, Anson Marston, R. B. Morse, and Robert Spurr Weston. The report of the Executive Committee and the financial statement of the Division were read, and the report of the Committee on New Jersey Sewage Experiments was presented by title. The Chairman also announced that the appointment of a committee to consider the subject of stream pollution and related subjects had been decided upon by the Executive Committee.

A paper by Harry Y. Carson, M. Am. Soc. C. E., entitled "The Protective Action of Cement Lining in Iron Pipe", was presented by Mr. Carson, and discussed by Messrs. P. J. Freeman and W. D. Walker. Walter E. Spear and Charles W. Sherman, Members, M. Am. Soc. C. E., presented papers on the "Safe Depth of Wells for Water Supply Near the Sea Coast", Mr. Sherman's subject being "Ground-Water Supplies from the Dunes of Holland". The subject was discussed by J. F. Jackson, M. Am. Soc. C. E.

The Progress Report of the Committee on Filtering Materials for Water and Sewage Works was presented in abstract by Samuel A. Greeley, M. Am. Soc. C. E., and, on motion, the report was accepted and the Committee continued.

### Structural Division Holds Meeting

The meeting of the Structural Division was called to order at the Engineering Societies Building, New York, N. Y., at 10:00 A. M., January 20, 1927, Chairman Clement E. Chase presiding.

The report of the Tellers on the ballot for the Executive Committee of the Division for 1927 was announced, as follows: Messrs. G. E. Beggs, C. E. Chase, P. G. Lang, Jr., A. E. Lindau, F. E. Richart.

A paper by Charles Terzaghi, M. Am. Soc. C. E., entitled "The Science of Foundations—Its Present and Future", was presented by the author, and the subject was discussed by Messrs. Charles R. Gow, E. P. Goodrich, J. Albert Holmes (illustrated with slides), and G. W. Rathjens.

After a brief address by President John F. Stevens, the report of the Structural Committee on Florida Hurricane Effects was read by H. G. Balcom, M. Am. Soc.



C. E., Chairman. The subject was discussed by Messrs. M. A. Stone and Henry Goldmark.

Fred T. Llewellyn, M. Am. Soc. C. E., addressed the meeting on "Some Phases of Research in Structural Welding", illustrating his remarks with lantern slides. Mr. Llewellyn was followed by H. H. Moss, Esq., Engineer, Linde Air Products Company, New York, N. Y., whose subject was "Permeability as a Factor in Structural Welding". The subject was discussed briefly by Lewis E. Moore, M. Am. Soc. C. E.

### Meeting of Surveying and Mapping Division

The meeting of the Surveying and Mapping Division was held January 20, 1927, at 2:10 p.m. in the Engineering Societies Building, New York, N. Y., William Bowie, Chairman, presiding.

After a brief survey of the past and future work of the Division since its organization, by Chairman Bowie, Secretary C. V. Hodgson announced the personnel of the Control, Topographic, and Boundary Committees. The members of the Location and Construction Committee had not been appointed. Secretary Hodgson also outlined the work of the Committees and reported on the recommendations of the Executive Committee in regard to Affiliates of the Division. Various phases of surveying and mapping were then discussed by Messrs. Clarence T. Johnston, Henry J. Sherman, and Charles E. Wells.

A paper by Clarence T. Johnston, M. Am. Soc. C. E., entitled "Boundary Surveys, Private and Political", was presented by the author, and discussed by Messrs. Frank M. S. Johnson (read by Joseph C. Thoma, M. Am. Soc. C. E.), Henry J. Sherman, G. M. Bowers, W. N.

Brown, Robert L. Tate, Russell S. Wise, and R. H. Randall. A paper on "Topographic Surveys", by W. N. Brown, M. Am. Soc. C. E., was presented by the author. This was followed by general discussion of the subject by Messrs. Charles E. Wells, W. H. Halsey, E. A. Fisher, Russell S. Wise, Gerard H. Matthes, Alexander Blair, W. N. Brown, J. C. Thoma, R. H. Randall, C. H. Birdseye, E. A. Van Deusen, and T. P. Pendleton.

### Advancement of Science

#### American Association Holds Annual Meeting

At the yearly meeting of the American Association for the Advancement of Science held in Philadelphia, Pa., December 27, 1926, to January 1, 1927, the Society was represented by George Gibbs, M. Am. Soc. C. E., whose interesting report will be briefly summarized.

The work of the Association is divided among a number of Divisions or Sections. That covering Engineering, Section M, will be under the guidance of A. N. Talbot, Past-President, Am. Soc. C. E., for the coming year.

Many addresses of interest to engineers were made at the various sessions. Among these may be mentioned one by Professor M. I. Pupin on "Fifty Years' Progress in Electrical Communication"; a paper on "Imhoff Tanks", by Harrison P. Eddy, M. Am. Soc. C. E., following the general presentation of the same subject before the Sanitary Engineering Division of the Society at its meeting in New York, N. Y., on January 17, 1924\*; and an address by W. H. Fulweiler, Assoc. M. Am. Soc. C. E., on "The Relationship Between Science and the Study and Testing of Engineering Materials". Fuller details of the various presentations are expected to appear in *Science*, the official organ of the Association.

\* *Transactions*, Am. Soc. C. E., Vol. 88 (1925), p. 465.

## Meetings of the Board of Direction

This is an abstract of the notes of the Secretary and subject to approval by the Board of Direction at its next meeting.

The Board met at Society Headquarters on January 17 and 18, 1927, the following being in attendance: President George S. Davison, Secretary George T. Seabury, and, also, Messrs. Braune, Brown, Chevalier, Dewell, Farnham, Gilman, Grunsky, Hammond, Hatton, Hazen, Howe, Huber, Humphrey, Ketchum, Merriman, Raymer, A. O. Ridgway, Robert Ridgway, Sawyer, Spofford, Taber, Webster, and Treasurer Hovey.

### Annual Report of the Board of Direction

The Annual Report of the Board\* was approved and adopted.

### Approval of Minutes of Board

On motion, the minutes of the meetings of the Board of Direction held on October 1 and 2, and December 3, 1926, were approved.

### Approval of Minutes of Executive Committee

On motion, the minutes of the meeting of the Executive Committee held on December 17, 1926, and the supplement thereto, were approved, and the actions outlined therein were adopted as the action of the Board, with the exception of certain recommendations which were discussed and acted on separately.

### Analysis of Reasons for Joining the Society

An analysis of the replies received from the last 1000 members who had joined the Society as to why they had joined, was presented. On motion, an abstract of this study was ordered published in *Proceedings*.†

### Local Section Allotments

The Board re-affirmed its policy as adopted at the October meeting that the allotments to Local Sections be based upon each Section's needs, instead of a flat rate per number, but that, in general, no allotment exceeding \$2 shall be made unless the dues of the Section for resident members are at least \$2.

### Stevenson Creek Dam

Further contribution toward the work on the test program of the Stevenson Creek Dam was approved, and the Executive Committee was authorized to make the necessary appropriations.

### Miami Section

On motion, the formation of the Miami Section was authorized and its Constitution was approved.

\* See Society Affairs, p. 73.

† Loc. cit., p. 58.

### Joint Committee on Stresses in Structural Steel

The report of the Joint Committee on Stresses in Structural Steel, composed of five representatives of the American Institute of Steel Construction and five representatives of the Society, was received, and the subject-matter relating to allowable stresses was ordered published for the information of the membership.\*

### Report of Committee on Professional Conduct

The Committee on Professional Conduct presented a draft of the Code of Practice, originally prepared by a committee of the Northeastern Section, after having been reviewed and modified in the light of suggestions following publication in *Proceedings*.† On motion, the Code was adopted and ordered published as a Manual of Engineering Practice.

### Report of Committee on Student Chapters

Upon recommendation of the Committee on Student Chapters applications for the formation of Student Chapters at Washington and Lee University and Rose Polytechnic Institute were granted. It was also decided that Freshmen should not be given the privilege of wearing the Student Badge of the Society.

### Budget for 1927

The following proposed Budget for 1927, recommended by the outgoing Board to this Board for adoption was considered and approved:

#### INCOME

Item.	Estimated income for 1927.	
1 Entrance Fees .....	\$20 000	
2 Dues .....	247 000	
3 Sale of Publications.....	8 000	
4 Binding of <i>Transactions</i> .....	13 500	
5 Sale of Badges.....	5 875	
6 Sale of Certificates.....	900	
7 Annual Meeting .....	5 000	
8 Interest on Bank Balance.....	1 000	
9 Interest on Securities.....	4 000	
10 From 57th St. Property.....	22 703	
11 Postage .....	150	
12 Miscellaneous (Service-Revolving Fund).....	1 000	\$329 128
Suggested Appropriations (See "Disbursements")....		\$328 893
Unappropriated Balance .....		\$235

\* See Society Affairs, p. 139.

† *Proceedings*, Am. Soc. C. E., September, 1926, Society Affairs, p. 415.

## DISBURSEMENTS

Item.	Appropriations for 1927.	
13 Salaries of Officers.....	\$18 125	
14 Retirement Allowances .....	8 454	
15 Clerical Help .....	78 896	
16 Cost of Publications.....	80 250	
17 Binding of <i>Transactions</i> .....	10 000	
18 General Printing .....	5 000	
19 Badges .....	4 036	
20 Certificates of Membership.....	839	
21 Annual Prizes .....	380	
Meetings:		
22 Annual Meeting .....	8 700	
23 Annual Convention .....	1 500	
24 Annual Spring Meeting .....	1 500	
25 Annual Summer Meeting (none in 1927).		
26 Annual Fall Meeting.....	1 500	
27 Monthly Meetings .....	1 300	
28 Local Sections .....	9 660	
29 Student Chapters .....	500	
Technical Divisions:		
30 Sanitary Engineering .....	1 450	
31 Power .....	1 000	
32 Irrigation .....	1 000	
33 Highway .....	750	
34 City Planning .....	1 000	
35 Structural .....	1 565	
36 Waterways .....	700	
37 Construction .....	700	
38 Surveying and Mapping.....	700	
39 Traveling Allowance of Officers.....	16 150	
40 Traveling Allowance of Standing Committees.....	2 900	
41 Work of Committees.....	11 900	
42 Reading Room .....	500	
43 Employment Service .....	1 815	
44 Office Supplies .....	4 000	
45 Postage .....	17 675	
46 Furniture and Office Equipment.....	2 000	
47 Current Business .....	4 000	
48 United Engineering Society:		
General Assessment (Rent).....	9 223	
Library .....	8 000	
Telephone .....	1 300	
John Fritz Medal Board.....	175	
49 Interest on Mortgage.....	4 500	
50 Premium on Insurance.....	250	
51 Miscellaneous (Service-Revolving Fund).....	1 000	
52 Stevenson Creek Dam (With reservation).....	4 000	\$328 893

## Report of Public Relations Committee

The following resolution, offered by the Public Relations Committee, was adopted:

"At a meeting of the Board of Direction of the American Society of Civil Engineers, it is hereby resolved that the Board favors the passage of the



Woodruff-McNary bill providing for the purchase of further timber areas by the United States such areas to be devoted to, and administered for, the growth of forests."

### Report of Committee on Districts and Zones

In order to comply with the Constitution the Board re-affirmed the District and Zone boundaries as fixed at the October meeting, at which it was decided to make no changes in the boundaries for 1927.

### Meeting of January 20, 1927

The Board met at Society Headquarters on January 20, 1927, the following being in attendance: President John F. Stevens, Secretary George T. Seabury, and, also, Messrs. Braune, Brillhart, Chevalier, Davison, Dennis, Dewell, Dufour, Gilman, Hammond, Hazen, Hoyt, Huber, Lucas, Ridgway, Sawyer, Taber, and Treasurer Hovey.

### Freeman Fund

The report\* of the Freeman Fund Committee was presented and approved.

### Standing Committees of the Board

The following Standing Committees of the Board for 1927, were appointed:

*Executive Committee.*—John F. Stevens, *Chairman*, Allen Hazen, *Vice-Chairman*, Willard T. Chevalier, George S. Davison, and John C. Hoyt.

*Technical Procedure Committee.*—John F. Stevens, *Chairman*, W. T. Chevalier, H. D. Dewell, Charles Gilman, F. E. Turneure, the Chairmen of the nine Technical Divisions of the Society, and George T. Seabury, *Secretary*.

*Committee on Meetings and Publications.*—Charles Gilman, *Chairman*, F. O. Dufour, George J. Ray, Charles M. Spofford, and Frank M. Williams.

*Public Relations Committee.*—A. J. Hammond, *Chairman*, H. W. Dennis, Robert Ridgway, D. H. Sawyer, and Edward G. Taber.

*Honorary Membership Committee.*—Robert Ridgway, *Chairman*, George S. Davison, Allen Hazen, John C. Hoyt, Walter L. Huber, Arthur E. Morgan, and John F. Stevens.

*Committee on Local Sections.*—H. D. Dewell, *Chairman*, T. Chalkley Hatton, and D. H. Sawyer.

*Committee on Professional Conduct.*—Walter L. Huber, *Chairman*, A. J. Hammond, and Charles H. Paul.

*Committee on Student Chapters.*—G. M. Braune, *Chairman*, C. M. Buck, and George L. Lucas.

*Committee on Research.*—F. E. Turneure (term of 2 years), *Chairman*, G. M. Braune (1 year), A. N. Talbot (2 years), Anson Marston (1 year), F. E. Schmitt (1 year), Milo S. Ketchum (3 years), and Thomas H. Wiggin (3 years).

*Committee on Registration of Engineers.*—Frank M. Williams, *Chairman*, C. M. Buck, J. H. Brillhart, A. R. Raymer, and Edward G. Taber.

*Committee on Aims and Activities.*—Charles H. Paul, *Chairman*, H. W. Dennis, T. Chalkley Hatton, Arthur E. Morgan, and C. M. Spofford.

\* See Society Affairs, p. 60.

## Local Sections\*

**Central Ohio.**—January 11, 1927. A dinner meeting was given by the Student Chapter of the Ohio State University, at which Mr. Samuel S. Wyer gave an address on "The Chicago Water Steal". About 50 students and 15 members of the Section were in attendance.

January 13, 1927. After a luncheon and business meeting a paper was presented by Mr. T. B. Shertzer on "The Ohio Dolomites and Their Use in Industry". Attendance 23.

**Colorado.**—January 10, 1927. A dinner preceded the meeting which was held at the Denver Athletic Club. Mr. W. S. Snelson, Senior Irrigation Specialist with the Dominion Water Power and Reclamation Service, Department of the Interior, addressed the meeting on "Some Recent Investigations in the Seasonal Use of Water by Plants", illustrating his remarks with lantern slides. Attendance 31.

**Detroit.**—January 26, 1927. After the routine business Mr. William H. Adams spoke of the papers and discussions delivered at the meeting of the Structural Division, at New York, N. Y., during the Annual Meeting. Mr. E. M. Walker then explained a type of low retaining wall which he had used successfully with considerable saving of cost over the usual type. He also presented some data on soil loadings. This was followed by a discussion of the action under load of the local clay soil. Mr. D. A. Molitor presented a paper entitled "Beauty and Things Beautiful", that was followed by discussion. Attendance 26.

**Duluth.**—January 17, 1927. After a luncheon and business meeting, Mr. Harland Bartholomew gave an interesting talk on City Planning. Attendance 30.

**Iowa.**—January 25, 1927. The meeting was held at Hotel Fort Des Moines, at Des Moines, with a program of informal talks. Mr. Lewis M. Martin spoke on "Engineers' Registration Laws", and Mr. James F. Harvey on "Conditions in Colombia, South America". Dean Anson Marston addressed the meeting on "Iowa's Industries". Attendance 30.

**Kansas (State) Section.**—January 20, 1927. A dinner meeting was held at the Jayhawk Hotel, in Topeka. The meeting was a social affair, no business being transacted. Attendance 28.

**Lehigh Valley.**—The following officers will serve in 1927: President, T. H. Moyer; Secretary-Treasurer, M. O. Fuller.

**Nashville.**—January 17, 1927. The following officers were elected: President, William E. Wilbur; Vice-President, R. H. Baker; Secretary-Treasurer, W. D. Glenn; Directors, Hunter McDonald and C. N. Bass.

\* For list of Local Section Officers, Rules, etc., see 1926 Year Book, p. 88.

**Portland (Ore.).**—October 15, 1926. A plan was outlined by President E. C. Willard by which it was proposed that the Section unite with other Sections of the Oregon Technical Council in holding joint meetings. After discussion the plan was approved. The address of the evening was given by Maj. R. T. Coiner, District Engineer, covering the work of the Engineering Department in general and its local activities in particular. Attendance 19.

**Sacramento.**—January 4, 1927. Mr. A. Strader, Art Director of the Ad Club, addressed a Joint Meeting of the Section and the Local Chapter of the American Association of Engineers on "Commercial Art". Attendance 40.

January 11, 1927. This was the Fifth Annual Meeting of the Section and the following officers were elected for 1927: President, Drury Butler; Second Vice-President, Fred J. Grumm; Secretary, Norwood Silsbee. The Secretary's report for 1926 showed a membership of 64, a gain of 10 over 1925, and an average attendance at the weekly luncheons of 33. Attendance 30.

January 21, 1927. The Annual Dinner Dance of the Section was given at the Elks Club and the officers for 1927 were installed. Retiring President Everett N. Bryan reviewed the activities of the Section during the past year and the new President, Mr. Drury Butler, spoke on the present-day problems confronting the engineer. Mr. Fred J. Grumm, in behalf of the Section, presented Mr. Bryan with the gavel he had used as President, suitably engraved. Attendance 63.

January 25, 1927. Mr. Gordon Zander, of the State Division of Water Rights, read a paper on "The Adjudication of Water Rights". Attendance 25.

**St. Louis.**—January 24, 1927. After a business meeting Mr. Edward Flad addressed the Section on a proposed plan to reduce the smoke nuisance in St. Louis. A discussion followed.

**San Diego.**—January 24, 1926. The following officers were elected: President, T. H. King; Vice-President, W. M. Butts; Secretary-Treasurer, C. B. Sadler.

## Annual Reports

### ANNUAL REPORT OF THE BOARD OF DIRECTION FOR THE YEAR ENDING DECEMBER 31, 1926

In compliance with the Constitution, the Board of Direction presents its Report for the year ending December 31, 1926.

#### THE SEVENTY-FOURTH YEAR

##### Death of Director Maitland

Alexander Maitland, Jr., Director of the Society, died December 24, 1926.

##### 57th Street Property

A business arrangement with respect to the property owned by the Society and located at 220 West 57th Street, New York City, has been consummated, which is felt to be most advantageous. The lease to the present tenant runs until December 14, 1928, but subject to this lease and beginning as of July 1, 1926, the property has been leased to the Broadway-John Street Corporation for a term of approximately 65 years.

Under the terms of the leasehold the Broadway-John Street Corporation paid to the Society on July 1 last the lump sum of \$30 195.18 in lieu of rent over and above that paid by the present tenant for the period between July 1, 1926, and December 14, 1928, and further secured the Society by a surety bond in amount equivalent to two years' rent. Beginning on December 15, 1928, the leasehold runs for three periods of 21 years each, with an annual net rental of \$52 500 for the first period and annual net rentals for the second and third periods at the rate of 5.5% of the re-appraised value of the property treated as land alone, but in no event to be less than \$52 500.

Under the terms of the leasehold, also, the tenant is to erect and maintain, free to the Society of all costs of every possible nature, a structure which in the opinion of the Board will be adequate to produce annually amortization charges, the upkeep, the operating and the rental expenses.

The cost of the first two lots (50-ft. frontage, purchased in 1895) was \$80 000, and the cost of the third lot (25-ft. frontage) purchased in 1904, was \$100 000. The total cost, including legal fees, was \$185 406.20. Thus the property has proved a most profitable investment in that it is now to return to the Society an annual net rental equivalent to interest on a capital sum of more than \$1 000 000 and at the same time by virtue of the leasehold to insure to the Society continued ownership in a property located so as unquestionably to increase in value and to yield further income reflecting that increase.

##### Student Chapters

Student Chapters are now authorized in 86 of the leading schools of engineering. Conscious of this interest in the Society by students in civil engineering, efforts have been made to give especial attention to their point of view. Part II of *Proceedings* is mailed regularly to all members of Student Chapters. In the months of March, April, and May, free copies of the Employment Service Bulletin were forwarded weekly to each of the 1 330 students enrolled in these Chapters who were members of the graduating



classes. Modification of the By-Laws has been effected making it somewhat easier for members of Student Chapters to become Juniors of the Society, by requiring only two Corporate Members as references on the applications of such graduates instead of the five required of others. Also, there has been adopted the rule that for those graduates of schools of engineering of recognized standing who shall make application for admission to the Society as Juniors within two months of graduation the equivalent of one year's dues shall be remitted.

### Part II of *Proceedings*

Many members of the Society live in foreign countries or in parts of Continental United States so located as to render it impracticable for them to attend frequently the meetings of the Society and they are thereby dependent upon the mails to a large extent for their conception of the Society's endeavors and activities other than in the strictly technical aspects presented through the medium of *Proceedings and Transactions*. In order that these members may have closer contact with the general activities of the Society, an informal sheet known as "Part II" of the *Proceedings* has been authorized and five issues of this publication have been forwarded with the more formal "Part I" of *Proceedings*.

The action of the Board in authorizing this supplementary publication was that it be continued for one year as an experiment and until it shall have been learned whether, in the minds of the membership, it has merit and should be continued.

### Expulsions

Acting on the basis of charges brought by Corporate Members of the Society in a Constitutional manner, the Board of Direction on July 12, 1926, after due consideration, expelled two members of the Society.

### Technical Procedure Committee

What is felt to be an outstanding feature of the year is the formation of the Technical Procedure Committee. The Society has at this time 9 Technical Divisions, the Executive Committees of which are actively engaged in the furtherance of civil engineering in the lines of their respective specialties. Being as they are an integral part of the Society, their work should be guided to avoid both omissions and duplications. Interests, it was realized, might at times grow strong in one group which might be prejudicial to the interests of another group, and to co-ordinate all these activities and interests the Technical Procedure Committee was brought into being. This Committee consists of the Chairman of each of the Technical Divisions; the Chairman of the Research Committee; the Chairman of the Meetings and Publications Committee; two members of the Board of Direction; the President of the Society; and the Secretary of the Society.

The Technical Procedure Committee has held two meetings, one at Kansas City, Mo., in the Spring and another at Philadelphia, Pa., in October; and has laid down a Code of Procedure outlining the several functions of all Society units and, further, has been already of great assistance both in co-ordinating the work of the Divisions and as advisory to the Board of Direction.

### Membership

The past year has been the record year of the Society's history so far as numbers go. The membership is now not only the largest it has ever been but the increase during the past year is the largest increase which the Society has seen. Elections during the year were 1 033, the total membership as of December 31 being 12 002.

A large, though not undue, proportion of the increase was in the Junior grade doubtless as a natural progression from membership in the Society's Student Chapters, but there also has been a very definite increase in the Member grade and a very marked increase in that of Associate Member.

### MEETINGS OF THE BOARD OF DIRECTION

There have been seven meetings of the Board of Direction during 1926:

January 18-19, New York, N. Y.

January 21, New York, N. Y.

March 15, New York, N. Y.

April 12-13, Kansas City, Mo.

July 12-13, Seattle, Wash.

October 1-2, Philadelphia, Pa.

December 3, New York, N. Y.

There have been four meetings of the Executive Committee held in New York during 1926, as follows: March 15, June 11, September 13, and December 17.

### MEMBERSHIP

The changes in membership are shown in the following table:

	JAN. 1, 1926.			JAN. 1, 1927.			LOSSES.				ADDITIONS.			TOTALS.		
	Resident.*	Non-Resident.	Total.	Resident.*	Non-Resident.	Total.	Transfer.	Resignation.	Dropped.	Died.	Transfer.	Election.	Reinstatement.	Loss.	Gain.	Increase.
Honorary Members.	4	11	15	4	10	14	.....	.....	.....	1	.....	.....	.....	1	.....	41
Members.....	872	4 173	5 045	930	4 281	5 211	.....	21	29	83	*155	130	14	133	299	166
Associate Members.	859	4 383	5 242	901	4 595	5 496	152	38	82	21	†83	440	24	293	547	254
Juniors.....	180	641	821	231	894	1 125	81	15	52	3	.....	455	.....	151	455	304
Affiliates.....	52	98	150	52	96	148	5	3	2	1	.....	8	1	11	9	42
Fellows.....	4	4	8	5	3	8	.....	.....	.....	.....	.....	.....	.....	.....	.....	.....
Total.....	1 971	9 310	11 281	2 123	9 879	12 002	238	77	165	109	238	1 033	39	589	1 310	721

\* 152 Associate Members and 3 Affiliates.

† 81 Juniors and 2 Affiliates.

‡ Decrease.

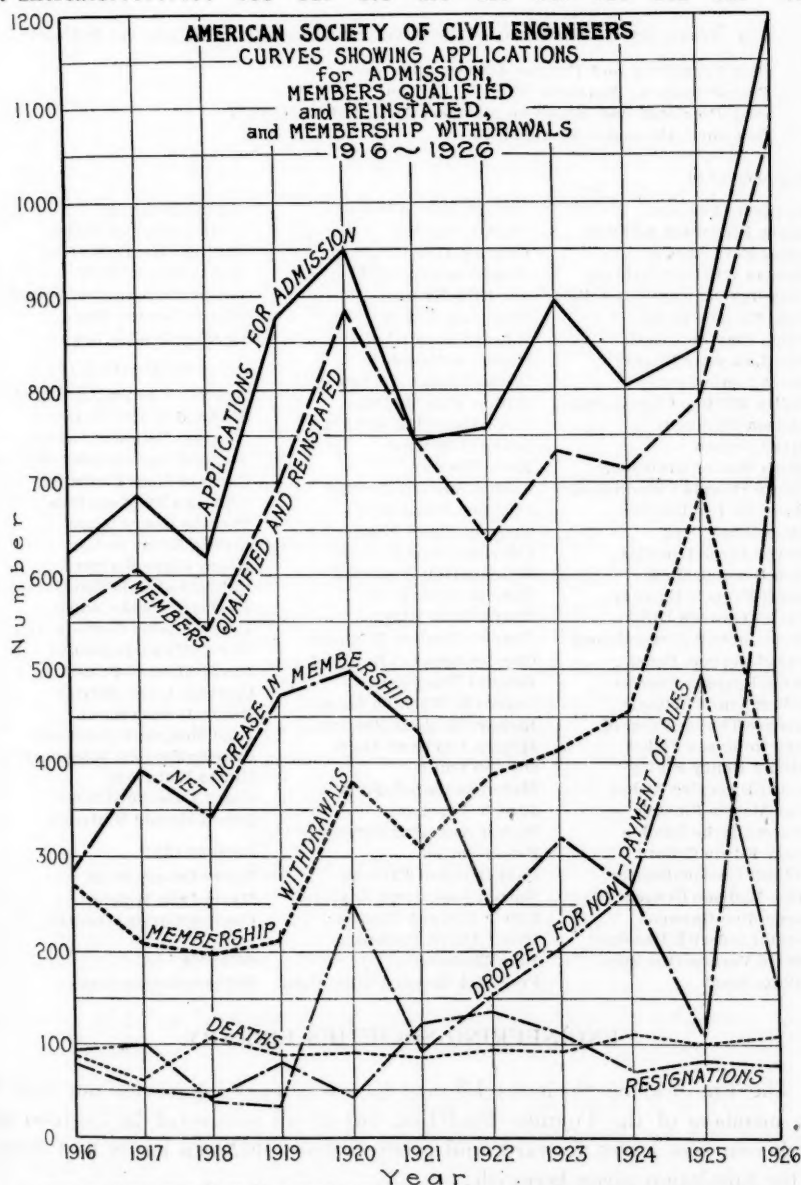
§ Those residing within fifty miles of the City Hall, New York, N. Y.

The net increase in membership for the year is 721.

### New Members and Net Increase

The following table shows the new members and the net increase during the past ten years. The accompanying diagram gives membership statistics for the same period.

	1917	1918	1919	1920	1921	1922	1923	1924	1925	1926
New Members*.....	608	537	687	887	743	636	733	715	795	1033
Net Increase.....	398	343	475	499	435	246	320	262	111	721



CURVES SHOWING NEW MEMBERS AND NET INCREASE IN MEMBERSHIP, 1916-1926.

\* Includes reinstatements.

### Applications for Membership

The total number of applications for membership was 1486, of which 1194 were for admission and 292 for transfer.

### Deaths

The losses by death during the year number 109 and are as follows:

*Past-Presidents and Present Officers (3):*

*Past-President:* Mordecai Thomas Endicott

*Past-President and Honorary Member:* Desmond FitzGerald

*Director:* Alexander Maitland, Jr.

*Members (81):*

Guilllaem Aertsen  
Henry Fleetwood Albright  
James Ekin Allison  
Thomas Williams Baldwin  
Cornellus Conway Felton Bent  
Miles Carlisle Bland  
Waldo Clayton Briggs  
John Lafayette Brower  
José Antonio Canals  
Phillip William Chamberlain  
Johnson Chapman  
Alfred Craven  
Robert Walter Creuzbaur  
Andrew Oswald Cunningham  
Augustine Lee Dabney  
James Work Deen  
Harvey Jacob Dressler  
Allen Douglas Duck  
Robert Francis Eastham  
Charles Gleason Elliott  
George Stovall Edmondstone  
Oswald Herbert Ernst  
Martin Ryerson Everett  
Herbert Clark Felton  
Clarence Thayer Fernald  
Clark Robinson Fickes  
William Henry Finley  
Samuel Brownlee Fisher  
Jacob Martin Floesch  
Francis Clarke Gamble  
George Edwin Gifford  
Vladimir Goriachkovsky  
James Madison Graves  
George Alec Harwood  
Joseph Frederick Hasskarl  
Howard Vernon Hinckley  
William Hood

Francis Edwin House  
Phelps Johnson  
Charles Albert Judson  
Augustus Sayre Kibbe  
Zac Ellis Knapp  
Hermann Kower  
Edward Nelson Lake  
Gustav Lehlbach  
Willard Datus Lockwood  
Wilbur Fisk McClure  
Louis Randolph McLain  
Leonard Metcalf  
Emil Newman  
Ashbel Edward Olmsted  
Chauncy Rusch Perry  
Thomas Elmer Phipps  
Charles Julius Poetsch  
William Galt Raymond  
Charles Swift Riché  
Morris John Riggs  
Charles Bradley Rowland  
Charles Leonard Rowland  
Edward Tracy Scovill  
Granville Wheaton Shaw  
Richard Willette Sherman  
Merritt Haviland Smith  
Oberlin Smith  
Milton Frederick Stein  
Joseph Strachan  
Walter Augustus Sumner  
Frank Sutton  
Paul Bertram Tallman  
Norton Longstreth Taylor  
Edwin Howard Thomes  
Henry Clark Thompson  
John Thomson  
Frederick Howard Tillinghast

Petrus Wahlman  
Mark Albigence Waldo  
William Henry Warren  
James Hollis Wells  
Julius Herman George Wolf  
Henry Beecher Wood  
Charles Griffith Young

*Associate Members (21):*

Frederick Baird Adams  
Richard Stockwell Bettes  
Vahram Yettvart Davoud  
Joseph Francis Sinnott Donnelly  
Bernard Hooe Fowle, Jr.  
Clarence Stephens Gale  
Thomas Henry Grant  
George Edgar Heller  
Henry Clyde Knight  
Dahyabhai Balabhai Kora  
Herbert Lincoln Nagel  
Harry Adolph Oesterle, Jr.  
David Elliott Pendleton  
David Thomas Pitkethly  
Clarence Owen Shively  
Ralph Jerome Smith  
John McKnight Southgate  
Charles Emmett Washburn  
Eitaro Watanabe  
Clark Luzerne Wilcox  
James Harold Williams

*Juniors (3):*

Harry Osborn Field  
Mario John Midolo  
Charles Curtis Woodruff, Jr.

*Affiliates (1):*

William Greene Dows

### ENGINEERING SOCIETIES LIBRARY

The Engineering Societies Library has continued its service not only to the members of the Founder Societies, but to all interested in engineering. Each year sees a step forward, and progress since 1925 can easily be followed in the tabulation given herewith:



	1925.		1926.	
Additions:				
Volumes (by gift).....	2 178		2 070	
“ (by purchase).....	539	2 717	2 027	4 097
Pamphlets (by gift).....	591		677	
“ (by purchase).....	227	818	168	845
Maps (by gift).....	143		141	
“ (by purchase) .....	16	159	9	150
Total additions .....		3 694		5 092
Permanent collection .....	110 319		113 135	
Expenditures for books, periodicals, binding, supplies, and salaries (approximate).....	\$41 000		\$41 000	
The Library was used by.....	35 511		33 000	
Including personal visits by.....	25 354		22 488	
Volumes cataloged .....	7 747		7 516	
Cards added to catalog.....	32 003		31 143	
Total catalog cards, arranged under subject.....	263 931		295 277	
Inquiries in Search Department.....	334		412	
Searches made .....	238		229	
Translations made .....	96		183	
Total number of words.....	191 930		423 875	
Photoprints made .....	27 373		32 838	
Number of persons securing photoprints.....	2 666		3 212	
Receipts for service.....	\$14 000		\$19 000	
Members borrowing books.....	204		231	

### READING ROOM OF THE SOCIETY

The attendance at the Reading Room during the year was 2 403.

Two hundred and seventy-six periodicals are regularly received, and this number covers many foreign periodicals.

The list of recent engineering articles of interest which is prepared monthly by the assistants in the Reading Room, contained 2 361 titles and covered 87 pages. Forty-nine periodicals were indexed.

The collection of books in this room, although small, has been selected with care, and a number of new titles have been added during the year.

### EMPLOYMENT SERVICE

The Boards of the Founder Societies approved the new plan for operating the Employment Service of the Founder Societies, September 1, 1923. The operation of the Service on this plan, together with the assistance received from the Founder Societies, has been sufficiently successful to make extensions of the Service in Chicago, Ill., in co-operation with the Western Society of Engineers, and San Francisco, Calif., in co-operation with the Engineers' Club of San Francisco, and the California Section of the American Chemical Society.

The extension of the Service to large cities other than New York is in pursuance of the recommendations adopted by the Boards of the Founder Societies.

The number of men placed during 1926 has averaged about 99 per month. The following table shows the registrations and placements in the three offices:

REGISTRATIONS AND PLACEMENTS IN THE  
NEW YORK, CHICAGO, AND SAN FRANCISCO OFFICES, IN 1926.

Month.	MEN REGISTERED.				MEN PLACED.			
	New York.	Chicago.	San Francisco.	Total.	New York.	Chicago.	San Francisco.	Total.
January ....	94	65	50*	209	72	.....†	8	.....†
February ...	80	77	50	207	64	.....	10	.....
March.....	109	61	50	220	104	.....	10	.....
April.....	109	66	50	225	60	.....	15	.....
May.....	125	58	50	233	77	.....	18	.....
June.....	142	61	50	253	112	.....	18	.....
July.....	73	56	50	179	77	.....	15	.....
August.....	87	58	50	195	66	.....	12	.....
September...	75	74	50	199	77	.....	11	.....
October.....	101	43	50	194	68	.....	7	.....
November...	74	45	50	169	64	.....	10	.....
December...	113	33	28	174	82	.....	7	.....
Totals.....	1 182	697	578	2 457	923	129	141	1 193

\* The San Francisco Office reports the number of members registered is approximately 50 per month up to December for which exact figures are given.

† Monthly figures not available.

### COMMITTEES

The sixteen Special Committees authorized to report on engineering subjects are as follows:

To Codify Present Practice on the Bearing Value of Soils for Foundations  
(Authorized December 3, 1912).

Stresses in Railroad Track (Authorized November 12, 1913).

To Consider and Recommend for Adoption a Specification for Bridge  
Design and Construction (Authorized August 9, 1920).

Standard Construction Contracts (Authorized June 6, 1921).

Electrification of Steam Railways (Authorized January 16, 1922).

Impact in Highway Bridges (Authorized April 4, 1922).

Flood Protection Data (Authorized April 4, 1922).

Irrigation Hydraulics (Authorized April 4, 1922).

Hydraulics Phenomena (Authorized April 4, 1922).

Concrete and Reinforced Concrete Arches (Authorized January 16, 1923).

Steel Column Research (Authorized January 16, 1923).

Effects of Earthquakes on Engineering Structures with Special Reference  
to the Japanese Earthquake of September 1, 1923 (Authorized October 16, 1923).

Cement (Authorized October 22, 1924).

Arbitration (Authorized January 19, 1925).

Engineering Contract Bonding (Authorized January 22, 1925).

City Planning of Washington, D. C. (Authorized April 20, 1925).

### Gifts for Committee Work

The liberal policy of former years has been adhered to by Engineering Foundation. During the past year it contributed \$2 500 to the work of the Special Committee on Concrete and Reinforced Concrete Arches and \$1 000 to the work of the Special Committee on Steel Column Research.

## PUBLICATIONS

Ten numbers of *Proceedings*, one volume of *Transactions*, a Year Book, and a new edition of the pamphlet entitled "Aims and Activities", have been published in 1926. Beginning with August, 1926, *Proceedings* has been issued in two parts; Part I, the regular Society publication of Society affairs, papers, discussions, and memoirs; and Part II, the informal news section, of which five numbers have been published in 1926.

The stock of the various publications of the Society kept on hand for the convenience of members and others now amounts to 78 600 copies, the cost of which to the Society for paper and press work only, has been \$18 061.03.

The table (see page 11) shows the cost per page for text and illustrations in *Proceedings* and *Transactions* for the past fourteen years.

The subjects of the papers and discussions in *Proceedings* and *Transactions* during the year, and the number of pages devoted to each, follows:

Subject.	<i>Transactions</i> , pages.	<i>Proceedings</i> , pages.
Highway Engineering.....	81	38
Snow Removal.....	16	16
Structural Engineering.....	399	466
Materials of Engineering.....	162	162
Dams.....	110	171
Tunnels.....	32	32
Railways.....	17	17
Hydrology, Hydraulics.....	264	151
Rainfall.....	53	53
Drainage and Irrigation.....	307	307
Waterways.....	211	57
Flood Protection.....	4	4
Water Power.....	137	71
Water-Works.....	36	16
Sanitation.....	199	22
Sewage Disposal.....	74	74
Garbage Disposal.....	51	51
City Planning.....	50	118
Traffic.....	11	11
Power Transmission.....	10	10
Surveying.....	71	71
Engineering Economics.....	8	8
Engineering History.....	23	23
Fire Prevention.....	34	4
	1 549	1 925

## Summary of Publications for 1926

	Issues	Average edition	Total pages	Plates	Cuts
<i>Proceedings</i> , Part I					
(monthly numbers) .....	10	12 200	3 046	1	602
<i>Proceedings</i> , Part II					
(monthly numbers) .....	5	15 430	20	..	11
<i>Transactions</i> , Vol. 89.....	1	12 100	1 786	10	485
Year Book .....	1	12 690	468	1	2
Aims and Activities.....	1	17 000	38	1	3
Total .....	18	....	5 358	13	1 103

TABLE SHOWING NUMBER AND COST OF PAGES AND COST OF ILLUSTRATIONS FOR *Transactions* AND *Proceedings*.

Year.	TRANSACTIONS.				PROCEEDINGS.				PROCEEDINGS AND TRANSACTIONS.				ILLUSTRATIONS.		
	Issues.	Edition.	PAGES.		Issues.	Edition.	PAGES.		Total pages.	Total cost.	Cost per page.	Cost.	Percentage of total cost.	Cost per page.	
			Per volume.	Total.			Per volume.	Total.							
1913	1	7 700	2 302	17 740 000	10	7 625	3 184	24 280 000	42 020 000	\$48 329.77	\$0.00103	\$3 964.16	9.1	\$0.000094	
1914	1	8 200	1 968	16 140 000	10	8 150	4 076	33 220 000	49 380 000	39 083.89	0.00079	2 963.32	7.6	0.000075	
1915	2	8 600	3 180	26 900 000	10	8 425	3 668	30 900 000	57 800 000	47 934.16	0.00083	3 684.68	7.7	0.000064	
1916	1	8 400	2 301	19 330 000	10	8 350	2 892	24 140 000	43 470 000	35 645.65	0.00082	1 403.12	3.9	0.000082	
1917	..	.....	.....	.....	10	8 550	3 482	29 350 000	29 350 000	28 608.18	0.00097	3 703.97	12.9	0.000126	
1918	1	8 700	1 879	16 340 000	10	8 950	2 341	20 950 000	37 230 000	33 785.64	0.00091	1 192.20	3.5	0.000032	
1919	1	9 000	1 775	15 980 000	8	9 100	2 096	19 075 000	35 035 000	32 082.69	0.00091	1 198.58	3.5	0.000032	
1920	..	.....	.....	.....	10	10 142	2 014	20 440 000	20 440 000	23 446.34	0.00115	2 552.27	10.9	0.000125	
1921	2 { 10 500	10 000 2 479 }	2 479 993 }	35 212 000	10	10 680	1 834	19 450 000	54 662 000	66 298.39	0.00121	2 084.72	3.1	0.000037	
1922	1	10 900	1 826	19 900 000	10	11 100	2 740	30 400 000	50 300 000	56 200.00	0.00112	3 700.00	6.6	0.000073	
1923	1	11 200	1 808	20 250 000	10	11 500	3 210	36 915 000	57 165 000	60 612.88	0.00106	4 809.88	7.9	0.000084	
1924	1	11 500	1 515	17 440 000	10	11 750	2 612	30 700 000	48 140 000	47 573.72	0.00099	4 579.04	9.6	0.000085	
1925	1	11 400	1 538	17 533 000	10	11 800	2 910	34 388 000	51 871 000	47 409.07	0.00091	6 359.19	13.4	0.000122	
1926		12 100	1 786	21 610 000	10	12 200	3 046	37 161 000	58 771 000	53 473.54	0.00091	5 080.91	9.5	0.000087	



The cost of publications, as determined by the bills actually paid during the year, has been:

For Paper, Printing, etc., <i>Proceedings</i> , Part I.....	\$27 421.15
For Paper, Printing, etc., <i>Proceedings</i> , Part II.....	1 670.82
For Paper, Printing, etc., of 14 435 Extra Copies of Papers, Discussions, <i>Memoirs</i> .....	1 453.90
For Paper, Printing, etc., <i>Transactions</i> , Vol. 89.....	10 765.19
For 4 125 Extra Copies of Separate Papers for <i>Transactions</i> , Vol. 89 .....	1 088.56
For Binding, Envelopes, etc., <i>Proceedings</i> , Part I.....	5 897.75
For Binding, etc., <i>Proceedings</i> , Part II.....	358.69
For Binding,* Boxes, etc., <i>Transactions</i> , Vol. 89.....	2 265.07
For Plates and Cuts.....	5 080.91
For Year Book.....	5 613.91
For "Aims and Activities".....	1 257.71
For Copyright and Sundry Expenses.....	113.96
Total.....	\$62 887.62
Deduct amount received from sale of publications.....	7 066.74
Net expenditures for publications in 1926.....	\$55 820.88

### MEETINGS

Eleven meetings of 16 sessions were held during the year, as follows: At the Annual Meeting, 1 (2 sessions); at the Spring Meeting at Kansas City, Mo., 1 (2 sessions); at the Summer Meeting at Seattle, Wash., 1 (2 sessions); at the Annual Convention at Philadelphia, Pa., 1 (3 sessions); and 7 regular meetings of the Society, held in the Engineering Societies Building, New York, N. Y.

At these meetings, there were presented 9 formal papers, 5 of which were illustrated with motion pictures and lantern slides, 1 Symposium (10 papers), and 4 Addresses.

During the year, there were also published 11 Progress Reports and 2 Final Reports of Special Committees, all of which were presented at the Annual Meeting, and 17 papers that were not presented at any meeting of the Society.

The number of members and others who took part in the preparation and discussion of these papers, symposium, addresses, and reports of Special Committees was approximately 315. This does not include those who took part in the preparation and discussion of papers presented at the meetings of the Technical Divisions which meetings are listed on page 15.

The total attendance at the 11 meetings of the Society was about 3 890. The registered attendance at the Annual Meeting was 1 102; at the Spring Meeting, 418; at the Summer Meeting, 513; and at the Annual Convention, 1 140.

\* Paper binding only.

The dates of the meetings of the Society during the year, together with the titles of papers, symposium, reports of Special Committees, etc., presented thereat, are as follows:

January 20, 1926, Progress Reports of Special Committees on Flood Protection Data, Concrete and Reinforced Concrete Arches, Steel Column Research, Cement, Standard Construction Contracts, Irrigation Hydraulics, Arbitration, Engineering Contract Bonding, Stresses in Railroad Track, Bearing Value of Soils for Foundations, and Effects of Earthquakes on Engineering Structures; and Final Reports of Special Committees on Stresses in Structural Steel and Impact in Highway Bridges.

February 3, 1926, "Relation of Depth to Curvature of Channels", by H. C. Ripley, M. Am. Soc. C. E.

March 3, 1926, "Pipe Tunnel Under the Gowanus Canal, Brooklyn, New York", by L. S. Stiles, M. Am. Soc. C. E.

April 14, 1926 (Two Sessions), "The Relationship of the Railroads to Modern Highway and Urban Traffic", by Ralph Budd, M. Am. Soc. C. E., and "Urban and Interurban Buses", by Britton I. Budd, Esq.

May 5, 1926, "Corrosion of Concrete", by John R. Baylis, Assoc. M. Am. Soc. C. E.

June 2, 1926, "Increasing the Efficiency of Passenger Traffic in City Streets", by John R. Miller, Jr., Assoc. M. Am. Soc. C. E.

July 14, 1926 (Two Sessions), Symposium on "The Logging and Lumbering Industries of the Pacific Northwest", by J. J. Donovan, and Walter J. Ryan, Members, Am. Soc. C. E., and Messrs. K. Berger, U. B. Hough, H. G. Cowling, W. T. Evenson, Bror L. Grondal, L. D. Beach, E. T. Allen, and J. B. Woods.

September 8, 1926, "Straight Line Plotting of Skew Frequency Data", by R. D. Goodrich, M. Am. Soc. C. E.

October 5, 1926, "A Century and a Half of American Engineering", address by George S. Davison, President, Am. Soc. C. E., and "One Hundred and Fifty Years of Progress in Civil Engineering", Addresses by Harrison Emerson, Esq., representing M. Louis Baelé, President, Société des Ingénieurs Civils de France; Dr. Max Krone, representing Dr. Karl Wendt, President, Verein deutscher Ingenieure, and George A. Walkem, President of the Engineering Institute of Canada.

November 3, 1926, "Water-Proof Masonry Dams", by W. Watters Pagon, M. Am. Soc. C. E.

December 1, 1926, "Quantities of Materials and Costs per Square Foot of Floor for Highway and Electric Railway Long-Span Suspension Bridges", by J. A. L. Waddell, M. Am. Soc. C. E.

The papers published in *Proceedings*, but not presented at any meeting of the Society, were as follows:

January, 1926, "Stresses in Helically Reinforced Concrete Columns", by A. W. Zesiger, M. Am. Soc. C. E., and E. J. Affeldt, Assoc. M. Am. Soc. C. E., and "Evaporation on United States Reclamation Projects", by Ivan E. Houk, M. Am. Soc. C. E.

February, 1926, "Virtual Work: A Restatement", by Hardy Cross, M. Am. Soc. C. E., and "Stresses in Thick Arches of Dams", by B. F. Jakobsen, M. Am. Soc. C. E.

March, 1926, "Aeroplane Topographic Surveys", by George T. Bergen, M. Am. Soc. C. E., and "Trend of Construction Cost of Certain Public Utilities", by William Breuer, Jun. Am. Soc. C. E.

May, 1926, "Analysis of Continuous Concrete Arch Systems", by Charles S. Whitney, M. Am. Soc. C. E., and "Field Procedure of Adjusting the Great Circle Line to the Rhumb Line", by N. B. Sweitzer, Assoc. M. Am. Soc. C. E.

August, 1926, "Distribution of Reinforcing Steel in Concrete Beams and Slabs", by Boyd S. Myers, M. Am. Soc. C. E.

September, 1926, "The Ancient Roman Aqueduct at Athens", by James F. Case, M. Am. Soc. C. E.; "Effect of Lightning on a Reinforced Concrete Pavement", by Winston E. Wheat, Assoc. M. Am. Soc. C. E.; and "Sag-Tension Curves", by Edwin S. Parker, Assoc. M. Am. Soc. C. E.

October, 1926, "Some Projects for Sewage Treatment under the Illinois Sanitary District Act of 1917", by Samuel A. Greeley, M. Am. Soc. C. E.; "Experimental Deformation of a Cylindrical Arched Dam", by B. A. Smith, M. Am. Soc. C. E.; and "The Design, Construction, and Operation of a Small Sewage Disposal Plant", by Franklin Hudson, Jr., Jun. Am. Soc. C. E.

November, 1926, "Venturi Tube Characteristics", by J. W. Ledoux, M. Am. Soc. C. E.

December, 1926, "Storage Required for the Regulation of Stream Flow", by Charles E. Sudler, M. Am. Soc. C. E.

#### MEDALS AND PRIZES

The award of Medals and Prizes for the year ending July, 1926, was as follows:

The Norman Medal to Julian Hinds, M. Am. Soc. C. E., for his paper entitled "Side Channel Spillways; Hydraulic Theory, Economic Factors, and Experimental Determination of Losses".

The J. James R. Croes Medal to Clarence S. Jarvis, M. Am. Soc. C. E., for his paper entitled "Flood Flow Characteristics".

The Thomas Fitch Rowland Prize to Nicholas S. Hill, Jr., M. Am. Soc. C. E., for his paper entitled "The Oradell Dam of the Hackensack Water Company".

The James Laurie Prize to Lewis A. Perry, Assoc. M. Am. Soc. C. E., for his paper entitled "The Hexagonal Slab Design of Concrete Pavement".

The Arthur M. Wellington Prize to Charles W. Kutz, M. Am. Soc. C. E., for his paper entitled "The Relation of the Ohio River and Its Tributaries to Transportation in the United States".

The Collingwood Prize for Juniors to Cecil Vivian von Abo, Jun. Am. Soc. C. E., for his paper entitled "Secondary Stresses in Bridges".

#### LOCAL SECTIONS

There are at present 45 Local Sections, no change having been made in the number during 1926.

The Board of Direction authorized visits of officers as heretofore, as it is felt that these visits have a stimulating effect at Headquarters and at the Sections visited. The Secretary visited 29 Sections; and the President 11 Sections. Ten of these visits were made jointly.

Allotments to Local Sections have been continued, and the amount paid in 1926 was \$8 010.

### TECHNICAL DIVISIONS

Meetings of the City Planning, Construction, Highway, Irrigation, Power, Sanitary Engineering, Structural, Surveying and Mapping, and Waterways Divisions have been held during the year.

The membership has shown an increasingly active interest in the work and activities of the various Divisions as is shown by the thirty-two Divisional programs given at the Quarterly Meetings.

The meetings of the Divisions during the year, together with the papers presented thereat, are as follows:

#### City Planning Division

January 21, 1926, Joint Meeting with the American City Planning Institute (Two Sessions), "Town Planning and Its Relations to the Professions Involved",\* by John Nolen, M. Am. Soc. C. E.; "The Development of Mariemont, Ohio",† by Frederic H. Fay, M. Am. Soc. C. E.; and "The Cincinnati City Plan is Now Law",‡ by George B. Ford, Esq.

April 15, 1926, "Some Observations on City Planning", by Louis R. Ash, M. Am. Soc. C. E.; and "Reducing the Cost of the Highway Plan Under the City Plan", by Charles E. Donnelly, Assoc. M. Am. Soc. C. E.

July 15, 1926, "Preparing the Groundwork for a City: The Regrading of Seattle, Washington", by Arthur H. Dimock, M. Am. Soc. C. E.; "The Arrangement of a Business District; Changes in Recent Years in Pittsburgh, Pa.", by Nathan Schein, M. Am. Soc. C. E.; and "The Planning of the Industrial City of Longview, Washington", by S. Herbert Hare, Esq.

October 7-8, 1926, Joint Meeting with American City Planning Institute (Two Sessions), "Basic Information Needed for Regional Planning", by Harold M. Lewis, M. Am. Soc. C. E.; "Housing and the Regional Plan", by John Ihlder, Esq.; "Cultural Opportunities in Regional Planning", by Andrew Wright Crawford, Esq.; and "Forecast—The Regional Community of the Future", by Thomas Adams, Esq.

#### Construction Division

January 21, 1926 (Organization Meeting), "Technical Problems in Construction Engineering", by E. J. Mehren, M. Am. Soc. C. E.; "Modern Methods of Winter Weather Construction on Reinforced Concrete Buildings, with

\* *Proceedings*, Am. Soc. C. E., October, 1926, Papers and Discussions, p. 1612.

† *Loc. cit.*, p. 1619.

‡ *Loc. cit.*, p. 1636.

Some Observations on the Latest Field Methods in Designing Concrete Mixtures", by William Joshua Barney, Assoc. M. Am. Soc. C. E.; and "Subway Construction Work in New York", by James C. Meem, M. Am. Soc. C. E.

April 15, 1926, "Scope, Aims, and Purposes of the Construction Division", by E. J. Mehren, M. Am. Soc. C. E.; and "Florida from a Construction Engineer's Standpoint", by John P. H. Perry, M. Am. Soc. C. E.

July 15, 1926, "Earth Work by the Hydraulic Method", by R. E. Miller, M. Am. Soc. C. E.; and "Review of Dam Construction on the Pacific Coast", by Arthur S. Bent, Affiliate, Am. Soc. C. E.

October 7, 1926, Joint Meeting with Structural Division, "Fifty Years' Progress in Bridge Building, with Special Reference to the Delaware River Bridge", by Ralph Modjeski, M. Am. Soc. C. E.; and "Fifty Years of Building Construction", by William A. Starrett, M. Am. Soc. C. E.

October 8, 1926, "Arbitration—Its Relation to Construction Contracts", by Moses H. Grossman, Esq.

#### Highway Division

January 21, 1926 (Two Sessions), "Economic and Engineering Problems of Highway Location",\* by W. W. Crosby, M. Am. Soc. C. E.; Bituminous Treatment of Earth Type Roads,† by W. B. Catchings, Assoc. M. Am. Soc. C. E.; and "Recent Developments in Concrete Pavements",‡ by H. Eltinge Breed, M. Am. Soc. C. E.

July 15, 1926, "Modern Crushed Stone and Gravel Surfacing", by J. W. Hoover, Esq.; "Relation of Road Type to Tire Wear", by O. L. Waller, M. Am. Soc. C. E.; and "Economics of Highway Bridge Types", by C. B. McCullough, Assoc. M. Am. Soc. C. E.

October 6, 1926, "History and Development of Road Building in the United States", by Thomas H. MacDonald, Esq.; and "History and Development of Road Building in France", by P. Le Gavrian, Esq.

#### Irrigation Division

July 15, 1926, "Some Phases of Irrigation Financing", by D. C. Henny, M. Am. Soc. C. E.; and "State Reclamation in Washington", by R. K. Tiffany, M. Am. Soc. C. E.

#### Power Division

January 21, 1926 (Two Sessions), "The Civil Engineering Features of the Kearny Power Station",§ by Roman von Fabrice, Assoc. M. Am. Soc. C. E.; "The Civil Engineering Features of the Hell Gate Power Station",|| by E. M. Van Norden and George A. Hughes, Members, Am. Soc. C. E.; and "The Soft Maple Dam", by W. P. Creager, M. Am. Soc. C. E.

\* *Proceedings*, Am. Soc. C. E., February, 1927, Papers and Discussions, p. 210.

† *Loc. cit.*, January, 1927, Papers and Discussions, p. 31.

‡ *Loc. cit.*, p. 33.

§ See Papers and Discussions, p. 366.

|| *Loc. cit.*, p. 337.



July 15, 1926, "Recent Water Power Developments in the State of Washington", by C. W. Harris, Esq.; and "The Lake Cushman Hydro-Electric Development of the City of Tacoma, Washington", by J. L. Stannard, M. Am. Soc. C. E.

October 6, 1926, "The Conowingo Hydro-Electric Development on the Susquehanna River", by Alexander Wilson, 3d, Esq.; "Preliminary Work with Federal and State Authorities Resulting in Issuance of License by Federal Power Commission", by William C. L. Eglin, Esq.; "Features of Design of Power Station and Hydraulic Equipment", by H. A. Hageman, M. Am. Soc. C. E.; "Construction Methods Employed on Dam and on Railroad Re-Location", by J. V. Hogan, Assoc. M. Am. Soc. C. E.; and "Construction Methods Employed on Power Station and on Tail-Race Excavation", by A. W. Clark, Esq.

### Sanitary Engineering Division

January 21, 1926, Symposium on "Garbage Disposal: Review of the Problem",\* by Samuel A. Greeley, M. Am. Soc. C. E.; "Disposal by Hog Feeding: Michigan Practice", by E. D. Rich, M. Am. Soc. C. E., and "California Practice", by Willis T. Knowlton, M. Am. Soc. C. E.; "Disposal by the Beccari System at Scarsdale, New York", by Arthur Boniface, Assoc. M. Am. Soc. C. E.; "High Temperature Incineration at Toronto, Ont., Canada", by James A. Burnett, Esq.; and "Cobwell System of Garbage Reduction and Some Phases of its Operation at Rochester, N. Y.", by John V. Lewis, Esq.

April 15, 1926, "The North Side Sewage Treatment Works of the Sanitary District of Chicago, Ill.", by Langdon Pearse and L. C. Whittemore, Members, Am. Soc. C. E., and I. P. Kane, Assoc. M. Am. Soc. C. E.; "The Construction Features of the North Side Sewage Treatment Works, Chicago, Ill.", by L. B. Barker, M. Am. Soc. C. E.; and "The Mechanical and Electrical Features of the North Side Sewage Treatment Works, Chicago, Ill.", by Messrs. J. T. Hawley and H. I. Steffa.

July 15, 1926, "Stream Pollution in the Pacific Northwest", by William F. Allison, M. Am. Soc. C. E.; "The Sewage Disposal Problem of Los Angeles, Calif.", by Willis T. Knowlton, M. Am. Soc. C. E.; and "The Work of the Los Angeles County Sanitation Districts", by Albert K. Warren, Assoc. M. Am. Soc. C. E.

October 6, 1926, Symposium on "Historic Review of the Development of Sanitary Engineering in the United States During the Past One Hundred and Fifty Years": (1) "Water Works", by George W. Fuller, M. Am. Soc. C. E.; (2) "Sewerage and Drainage of Towns", by Harrison P. Eddy, M. Am. Soc. C. E.; (3) "Refuse Collection and Disposal", by Samuel A. Greeley, M. Am. Soc. C. E.; (4) "Land Drainage", by S. H. McCrory, M. Am. Soc. C. E.; (5) "Mosquito Control", by J. A. Le Prince, Esq.; and (6) "Ventilation", by Dr. George T. Palmer.

October 7, 1926, Symposium on "Industrial Waste Disposal": (1) "Introduction", by W. L. Stevenson, M. Am. Soc. C. E.; (2) "Oil Refinery Wastes",

\* *Proceedings*, Am. Soc. C. E., October, 1926, Papers and Discussions, p. 1641 et seq.

by Robert Spurr Weston, M. Am. Soc. C. E.; (3) "Coal Mine Drainage", by Andrew B. Crichton, Esq.; (4) "Pulp and Paper Mill Wastes", by George K. Spence, Esq.; and (5) "Tannery Wastes", by Wilhelm Howalt, M. Am. Soc. C. E., and Edwin Cavett, Esq.

### Structural Division

January 21, 1926 (Two Sessions), "The Design and Construction of the Eye-Bar Cable Suspension Bridge at Florianopolis, Brazil", by D. B. Steinman, and William G. Grove, Members, Am. Soc. C. E.; and "The Engineer's Responsibility for Better Forest Utilization", by Dudley F. Holtman, Assoc. M. Am. Soc. C. E.

July 15, 1926, "The Coolidge Dam Project", by C. R. Olberg, M. Am. Soc. C. E.; "Structural Welding", by Frank P. McKibben, M. Am. Soc. C. E.; "Earthquakes in Relation to Engineering Substructures", by H. D. Dewell, M. Am. Soc. C. E.; "The Status of Research in Foundation Problems", by Charles R. Gow, M. Am. Soc. C. E.; "Recent Timber Bridge Practice on the Pacific Coast", by C. E. Andrew, M. Am. Soc. C. E.; and "Integral Arch Action—Results of Some Recent Investigations", by G. E. Beggs, M. Am. Soc. C. E.

October 7, 1926, Joint Meeting with Structural Division, "Fifty Years' Progress in Bridge Building, with Special Reference to the Delaware River Bridge", by Ralph Modjeski, M. Am. Soc. C. E.; and "Fifty Years of Building Construction", by William A. Starrett, M. Am. Soc. C. E.

October 8, 1926, "One Hundred and Fifty Years' Advance in Structural Analysis", by H. M. Westergaard, Assoc. M. Am. Soc. C. E.; and "The Richmond Power Station: Structural Features and Foundation Problems", by Frank N. Kneas, M. Am. Soc. C. E.

### Surveying and Mapping Division

October 6, 1926 (Organization Meeting), "Historical Notes on Philadelphia Surveys with Data Relating to Property Surveys and the Establishment of the City Plan", by J. Harvey Gillingham, M. Am. Soc. C. E.; "Surveys on the Coast of New Jersey", by Victor Gelineau, M. Am. Soc. C. E.; and "Surveying in the United States", by C. H. Birdseye, M. Am. Soc. C. E.

### Waterways Division

January 21, 1926 (Two Sessions), "The Deeper Hudson", by John R. Slatery, M. Am. Soc. C. E.; and "The New York State Barge Canal and Its Operation",\* by Roy G. Finch, M. Am. Soc. C. E.

July 15, 1926, "The Lake Washington Ship Canal", by W. J. Barden and A. W. Sargent, Members, Am. Soc. C. E.; and "The Work of the Port of Seattle", by George F. Cotterill, Esq.

October 8, 1926, "Review of the Progress in Waterways Engineering During the Past Fifty Years", by William Murray Black, M. Am. Soc. C. E.; and

\* *Proceedings*, Am. Soc. C. E., October, 1926, Papers and Discussions, p. 1679.

"Improvement of the Delaware River Below Philadelphia", by Frank C. Boggs, M. Am. Soc. C. E.

### Membership of Technical Divisions

The membership of the Technical Divisions is as follows:

City Planning Division.....	880
Construction Division .....	1 070
Highway Division.....	1 415
Irrigation Division .....	633
Power Division .....	484
Sanitary Engineering Division.....	1 085
Structural Division .....	1 453
Surveying and Mapping Division.....	174
Waterways Division .....	420

### STUDENT CHAPTERS

There are at present 26 students who have taken advantage of the By-Law which enables them to continue affiliation with the Chapters until the first day of the second January following graduation.

### New Student Chapters

There are now 86 Student Chapters, the total membership of which is 4 807. Eleven new Chapters were organized during the year:

Michigan State College  
 Ohio Northern University  
 Princeton Engineering Society (Princeton University)  
 Stadia Club (Case School of Applied Science)  
 Union College  
 University of Akron  
 University of Arizona  
 University of Arkansas  
 University of Dayton  
 University of Florida  
 University of Idaho

The Student Chapter at Norwich University was disbanded by the Board April 12, 1926.

### FINANCES

The year 1926 was a prosperous one for the Society. The exceptionally large increase in membership has made it practicable to undertake during the year new activities. General expenses representing direct service to the membership were increased from \$251 000 in 1925 to 282 000 in 1926 (round figures).

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Notwithstanding payment of \$60 000 on the mortgage the year closes with a balance on hand in cash of \$25 408.47 and \$46 395.29 in short term securities, exclusive of the various Trust Funds which in themselves amount to \$77 291.45.

The amount of indebtedness to the Society carried as Assets on the General Balance Sheet representing uncollected dues amounts to \$15 698.71, as against \$13 180.35 for 1925. The experience of the past year indicates that a very large part of this will be collected.

The reports of the Secretary and Treasurer are appended.

By order of the Board of Direction,

GEORGE T. SEABURY, *Secretary*.

January 17, 1927.

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## REPORT OF THE SECRETARY FOR THE YEAR

TO THE BOARD OF DIRECTION OF THE AMERI

GENTLEMEN:—I have the honor to present a statement of Receipts and Disbursements for the fiscal year of the Society, ending December 31, 1926. There is also appended a general Balance Sheet showing the condition of the affairs of the Society.

Respectfully submitted,

GEORGE T. SEABURY,

Secretary.

## RECEIPTS

Balance on hand January 1, 1926*		\$70 047.45
Entrance Fees.....	\$21 565.00	
Current Dues.....	158 425.16	
Past Dues.....	9 988.42	
Advance Dues.....	57 593.79	
Binding of <i>Transactions</i> .....	8 372.85	
Badges.....	6 488.84	
Certificates of Membership.....	863.50	
Sale of Publications.....	7 066.74	
Interest on Deposits.....	1 007.35	
Interest on Investments.....	3 998.88	
Interest Accrued.....	835.97	
Annual Meeting.....	4 507.04	
Rent from 57th Street Property.....	22 703.32	
Postage.....	150.20	
Miscellaneous.....	2 737.31	
The Freeman Fund.....	1 654.96	
For Power Division:		
1926 Dues.....	312.00	
1927 Dues.....	149.00	
For City Planning Division:		
1926 Dues.....	65.00	
1927 Dues.....	50.00	
From Engineering Foundation in Credit to Special Committee on Steel Column Research.....	1 000.00	
From Engineering Foundation in Credit to Special Committee on Concrete and Reinforced Concrete Arches.....	2 500.00	
Maturity of Bonds.....	101 259.58	
The 57th Street Property Fund.....	30 195.18	443 490.09

\$513 537.54

*Society Funds in Garfield National Bank.....	\$57 269.15	
Petty Cash (in hands of Secretary).....	5 000.00	
In Chase National Bank.....	500.00	\$62 769.15
For Special Committee on Stresses in Railroad Track.....		3 325.78
Collected for Power Division:		
1923 Dues.....	243.80	
1924 Dues.....	354.00	
1925 Dues.....	431.00	
1926 Dues.....	116.00	1 144.80
Collected for City Planning Division.....		45.00
Unexpended Balance of Funds Collected for the Rudolph Hering Medal.....	1 162.72	
For the Freeman Fund.....	1 600.00	
		<u>\$70 047.45</u>

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## YEAR ENDING DECEMBER 31, 1926

## AMERICAN SOCIETY OF CIVIL ENGINEERS.

## DISBURSEMENTS

Salaries of Officers.....	\$17 458.32	
Retirement Allowances.....	8 454.48	
Clerical Help.....	62 162.26	
Publications.....	62 887.62	
Binding of Transactions.....	4 845.76	
General Printing.....	3 527.70	
Badges.....	4 029.50	
Certificates of Membership.....	785.66	
Annual Prizes.....	373.79	
Meetings:		
Annual Meeting.....	7 755.28	
Annual Convention.....	2 157.94	
Annual Spring Meeting.....	1 473.55	
Annual Summer Meeting.....	1 310.56	
Monthly Meetings.....	1 173.82	
Local Sections.....	8 010.00	
Technical Divisions:		
Sanitary.....	1 190.91	
Power.....	693.24	
Irrigation.....	166.90	
Highway.....	672.31	
City Planning.....	1 330.97	
Structural.....	809.07	
Construction.....	619.62	
Waterways.....	316.72	
Surveying and Mapping.....	195.39	
Traveling Allowance of Officers.....	16 230.86	
Traveling Allowance of Standing Committees.....	2 097.48	
Work of Committees:		
Mileage.....	4 123.66	
Other Expenditures.....	8 764.82	
Reading Room.....	499.85	
Employment Service.....	1 815.00	
Office Supplies.....	3 879.54	
Postage.....	12 050.21	
Furniture and Office Equipment.....	2 725.74	
Current Business.....	3 894.96	
United Engineering Society:		
General Assessment.....	6 977.96	
Library.....	3 000.00	
Telephone.....	1 197.75	
John Fritz Medal Board.....	279.30	
Payment on Mortgage.....	60 000.00	
Interest on Mortgage.....	6 500.00	
Premium on Insurance.....	775.92	
Miscellaneous.....	2 944.14	
Purchase of Bonds.....	114 835.95	
Interest Accrued.....	1 380.92	
Rudolph Hering Medal.....	10.80	
Stevenson Creek Dam.....	5 400.00	
The 57th Street Property Fund.....	30 108.50	
Student Chapter Bulletin.....	334.34	
Alterations to 15th and 16th Floors.....	900.00	\$488 129.07
December 31, 1926, Cash on Hand.....		25 408.47*
		<u>\$513 537.54</u>
*Society Funds in Garfield National Bank.....	\$10 808.33	
Petty Cash (in hands of Secretary).....	5 000.00	
In Chase National Bank.....	500.00	\$16 308.33
For Special Committee on Stresses in Railroad Track.....		2 840.78
Collected for Power Division:		
1923 Dues.....	\$243.80	
1924 Dues.....	354.00	
1925 Dues.....	431.00	
1926 Dues.....	423.00	
1927 Dues.....	149.00	1 605.80
Collected for City Planning Division:		
1926 Dues.....	\$110.00	
1927 Dues.....	50.00	160.00
Unexpended Balance of Funds Collected for the Rudolph Hering Medal.....	1 151.92	
For the Freeman Fund.....	3 254.96	
The 57th Street Property Fund.....	86.68	
	<u>\$25 408.47</u>	

NEW YORK, January 13, 1927.

## DECEMBER 31, 1926

## OF THE SECRETARY

## LIABILITIES

1927 dues paid in advance, including \$149 for Power Division...	\$57 742.79	
Interest accrued on mortgage to December 31, 1926.....	2 083.30	
Unexpended balance for Committee on Stresses in Railroad Track	2 840.78	
1923 dues credited to Power Division .....	\$244.00	
1924 " " " " " .....	372.00	
1925 " " " " " .....	443.00	
1926 " " " " " .....	489.00	1 548.00
Collected for City Planning Division .....	160.00	
Unexpended balance of contributions to the Rudolph Hering Medal.....	1 151.92	
Income from Freeman Fund.....	\$3 254.96	
" " Fifty-Seventh Street Property Fund...	283.11	3 538.07
Mortgage payable, due February 1, 1929.....	100 000.00	

## Funds :

Herbert Steward Library Fund.....	\$ 2 000.00	
Joseph G. Swift " " .....	1 000.00	
Compounding Dues Fund.....	15 480.00	
Norman Medal Fund.....	1 000.00	
Rowland Prize Fund.....	1 222.50	
Collingwood Prize Fund.....	1 000.00	
Arthur M. Wellington Prize Fund.....	2 150.00	
Fellowship Fund.....	13 038.28	
Hiram F. Mills Legacy.....	2 000.00	
The Freeman Fund.....	23 410.00	
Fifty-Seventh Street Property Fund.....	14 990.67	
Reserve Fund.....	46 481.97	123 773.42

Surplus, including amount arising from revaluation of real estate.....	1 143 483.86
	<u>\$1 436 322.14</u>

ENGINEERS for the year ended December 31, 1926, and (assuming that the  
 cations on hand are correct) we certify that, in our opinion, the above balance

LYBRAND, ROSS BROS. & MONTGOMERY,

Accountants and Auditors.

**REPORT OF THE TREASURER OF THE  
AMERICAN SOCIETY OF CIVIL ENGINEERS  
FOR THE YEAR ENDING DECEMBER 31, 1926**

In compliance with the provisions of the Constitution, I have the honor to present the following report:

Cash on Hand January 1, 1926..... \$70 047.43

**RECEIPTS**

From current sources, January 1 to December 31....	\$283,600.90	
Dues collected to date for Power Division.....	461.00	
Dues " " " " " " City Plan-		
ning Division .....	115.00	
Rent from 57th Street Property:		
On old Lease.....	\$22 703.32	
On new Lease.....	30 195.18	52 898.50
<hr/>		
From Engineering Foundation for:		
Special Committee on Concrete and		
Reinforced Concrete Arches....	\$2 500.00	
Special Committee on Steel Column		
Research .....	1 000.00	3 500.00
<hr/>		
The Freeman Fund Investments.....	1 655.11	
Maturity of various Securities.....	101 259.58	443 490.09

**DISBURSEMENTS**

Payment of Bills by audited Vouchers for current		
business, January 1 to December 31.....	\$299 287.99	
Local Sections .....	8 010.00	
Technical Divisions .....	5 995.13	
Payment on Mortgage, 57th Street Property.....	60 000.00	
Purchase of Securities.....	114 835.95	
Balance on hand December 31, 1926:		
In Garfield National Bank.....	\$19 908.47	
In hands of Secretary.....	5 000.00	
In Chase National Bank.....	500.00	25 408.47
<hr/>		
	<b>\$513 537.54</b>	<b>\$513 537.54</b>
<hr/>		

Respectfully submitted,

OTIS E. HOVEY,  
*Treasurer.*

## Annual Reports of the Technical Divisions

### Annual Report of the Highway Division for 1926

An Executive Committee consisting of Messrs. C. D. Curtiss, Chairman and Secretary, A. N. Johnson, Paul D. Sargent, Frank T. Sheets, and Thomas E. Stanton, Jr., has conducted the affairs of the Highway Division during 1926.

Because attempts to arrange meetings of the Executive Committee never produced a quorum, the business of the Division during the last year has been conducted largely by correspondence. The Chairman had opportunity at different times, however, to discuss Division matters with some of the other members of the Committee.

During the year the Division Constitution was amended by letter-ballot to provide certain changes in the method of electing members of the Executive Committee. The following Nominating Committee was appointed to make Group 2 nominations for members of the Executive Committee for 1927: E. F. Kelley, *Chairman*, E. E. Duff, Jr., H. S. Mattimore, H. G. Shirley, and, J. T. Thompson.

This Committee nominated: Messrs. H. K. Bishop, H. E. Breed, and, S. B. Slack. The following old members of the Executive Committee were eligible for re-election under the new Constitution and formed Group 1 on the ballot: Messrs. A. N. Johnson, Paul D. Sargent, Frank T. Sheets, and, Thomas E. Stanton, Jr. The letter-ballot which was canvassed on January 19, 1927, resulted in the election of the following Executive Committee for 1927: Messrs. H. K. Bishop, H. Eltinge Breed, A. N. Johnson, Paul D. Sargent, and S. B. Slack.

Three meetings of the Division were held during 1926. Although advance plans had only been made to cover a meeting in connection with the Summer Meeting of the Society at Seattle, Wash., the Executive Committee waived its policy of holding only two meetings a year and held a Division meeting in connection with the Annual Convention in Philadelphia, Pa. This was done because of the elaborate plans made for the Annual Convention of the Society.

The first meeting of the Division was held in New York, N. Y., January 21, 1926, in connection with the Annual Meeting of the Society. At the morning session a paper prepared by W. W. Crosby, M. Am. Soc. C. E., Consulting Engineer (at that time Location Engineer, Pennsylvania State Department of Highways), Baltimore, Md., on "Economic and Engineering Problems of Highway Location"\* was read by E. E. Duff, Jr., Assoc. M. Am. Soc. C. E. Charles B. Breed, M. Am. Soc. C. E., Professor of Railway and Highway Engineering, Massachusetts Institute of Technology, and Consulting Engineer, Boston, Mass., discussed this paper. This was followed by a paper on "Bituminous Treatment of Earth Type Roads",† by W. B. Catchings, Assoc. M. Am. Soc. C. E., State Construction Engineer, Raleigh, N. C. At the

\* *Proceedings*, Am. Soc. C. E., February, 1927, Papers and Discussions, p. 210.

† *Loc. cit.*, January, 1927, Papers and Discussions, p. 31.



afternoon session, H. Eltinge Breed, M. Am. Soc. C. E., Consulting Highway Engineer, New York, N. Y., presented a paper on "Recent Developments in Concrete Pavements".\* A prepared discussion† of this paper by A. T. Goldbeck, Assoc. M. Am. Soc. C. E., Director, Engineering Bureau, National Crushed Stone Association, Washington, D. C., was read by R. W. Crum, M. Am. Soc. C. E., following which, motion pictures furnished by the U. S. Department of Agriculture, showing construction of the "Wendover Cut-Off", in Utah, and another film called "Surf to Summit", were shown.

The second meeting was held in Seattle, July 15, 1926, in connection with the Summer Meeting of the Society. J. W. Hoover, Esq., State Highway Engineer, Olympia, Wash., presented a paper on "Modern Crushed Stone and Crushed Gravel Surfacing". This paper was discussed by Roy A. Klein, Assoc. M. Am. Soc. C. E., State Highway Engineer, Salem, Ore., and C. H. Purcell, Assoc. M. Am. Soc. C. E., District Engineer, U. S. Bureau of Public Roads, Portland, Ore. W. D. Clarke, M. Am. Soc. C. E., Division Engineer, Oregon State Highway Commission, Salem, Ore., read Mr. Klein's prepared discussion. A paper on "Relation of Road Type to Tire Wear", prepared by O. L. Waller, M. Am. Soc. C. E., Consulting Engineer; Vice-President and Head of the Department of Civil Engineering, Washington State College, Pullman, Wash., and H. E. Phelps, M. Am. Soc. C. E., Professor of Highway Engineering, Washington State College, Pullman, Wash., was presented by Mr. Waller. C. B. McCullough, Assoc. M. Am. Soc. C. E., Bridge Engineer, State Highway Commission, Salem, Ore., discussed the subject of "Economics of Highway Bridge Types".

The third meeting was held in Philadelphia, October 6, 1926, in connection with the Annual Convention of the Society. In keeping with the character of the Society meeting and the Sesqui-Centennial Celebration, the program was of an historical nature. A paper by Thomas H. McDonald, Chief, U. S. Bureau of Public Roads, Washington, D. C., entitled "History and Development of Road Building in the United States" was read by H. K. Bishop, M. Am. Soc. C. E., Chief, Division of Construction, U. S. Bureau of Public Roads, Washington, D. C. A paper by P. Le Gavrian, Chief Engineer of Bridges and Highways, Paris, France, was scheduled, but did not arrive in time for presentation. The publication of these two papers in *Proceedings* will make available valuable historical data on highway development in the United States and France. The showing of motion pictures planned for this meeting had to be shortened, because of the elaborate entertainment program provided by the Local Committee.

In order that the Committee on Technical Procedure might have an opportunity to co-ordinate the plans of the Technical Divisions for future meetings, the Highway Division has determined on holding meetings in connection with the Annual Convention of the Society in Denver, Colo., in 1927, in connection with the Fall Meeting of the Society in San Diego, Calif., in 1928, and in connection with the Summer Meeting of the Society in 1929. These meetings, in addition to one in connection with the Annual Meeting of

\* *Proceedings*, Am. Soc. C. E., January, 1927, Papers and Discussions, p. 33.

† *Loc. cit.*, February, 1927, Papers and Discussions, p. 226.

the Society, will provide two meetings a year, which are as many as the Executive Committee believes to be desirable to schedule.

This completes the Highway Division's fourth year. The Division was launched at the Seventieth Annual Meeting of the Society, New York, N. Y., in 1923. The second meeting was held in connection with the Annual Convention of the Society in Chicago, Ill., on July 11, 1923, at which time the Constitution was adopted and Division policies were formulated. The first technical meeting was held in connection with the Fall Meeting of the Society, on October 17, 1923, in Richmond, Va.

Thus far, the work of the Division has been limited to the holding of meetings in connection with the Society meetings. Very excellent papers have been presented. Some means should be found of publishing these papers within a reasonable time in order that they may be available to the membership at large. No attempt has been made to enter fields already occupied by other highway organizations, nor is it believed that this should be done. There is opportunity, however, to expand the usefulness of the Division by making available through publication by the Society of monographs or manuals covering various phases of highway engineering. The preparation of such manuals could probably best be handled by committees.

C. D. CURTISS,

*Chairman-Secretary, Highway Division.*

### Annual Report of the Irrigation Division for 1926

The Irrigation Division has been able to hold only one meeting this year, that being at Seattle, Wash., during the Summer Meeting of the Society. The Executive Committee held two meetings, to wit, on July 13 and July 14 at Seattle. The activities of the Division, and its Executive Committee, have had to do with the details involved in the meetings referred to, the preparation and adoption of a new Constitution, the continuance of the work of Standing Committees and the creation of new Committees, participation in the work of the Technical Procedure Committee of the Society, and in an effort to increase the membership of the Division.

#### SEATTLE MEETING

This proved to be a most interesting meeting of the Division marked, as it was, by the presentation of splendid papers and active discussion. The registered attendance at the meeting was 40 and the unregistered attendance about 20. The papers presented at that meeting embraced the following: "Some Phases of Irrigation Financing", by D. C. Henny, M. Am. Soc. C. E., Consulting Engineer, Portland, Ore., with written discussion by Thomas H. Means, M. Am. Soc. C. E., Consulting Engineer, San Francisco, Calif., and M. C. Hinderlider, M. Am. Soc. C. E., State Engineer, Denver, Colo.; and "State Reclamation in Washington", by R. K. Tiffany, M. Am. Soc. C. E., Supervisor of Hydraulics, Olympia, Wash., with written discussions by J. R.

Luper, Assoc. M. Am. Soc. C. E., State Engineer, Salem, Ore., and W. G. Swendsen, Assoc. M. Am. Soc. C. E., State Engineer, Boise, Idaho.

Upon recommendation of the Executive Committee of the Division these papers have been approved for publication and in due time will appear in *Proceedings*. In addition to the papers presented, a progress report was made by M. C. Hinderlider, *Chairman*, for the Division's Committee on Interstate Water Rights.\*

#### NEW DIVISION CONSTITUTION

Early in the year the Board of Direction suggested to all Technical Divisions that they revise their Constitutions so as to provide definitely for some continuity of service of the membership of their Executive Committees. In accordance with that suggestion a revised Constitution of the Irrigation Division was prepared by its Executive Committee, which was subsequently submitted to a ballot of the Division and adopted. It provides that only two members of the Executive Committee shall be retired annually instead of five as formerly required. Incidentally, a few other, less important, changes were made, relating to number of meetings, Affiliates, etc. The new Constitution becomes effective this year (1927) and will appear in the forthcoming Year Book of the Society.

#### STANDING COMMITTEES

All previously existing Standing Committees were continued and, in addition thereto, three important new committees were created during the year. The complete list of Standing Committees, and their personnel, is as follows, the last three being the new committees appointed this year:

##### *Committee on Duty of Water Studies.*—

- S. T. Harding, Professor of Irrigation, University of California, Berkeley, Calif., *Chairman*.
- Harry Barnes, Resident Engineer, San Joaquin River Water Storage District, Los Banos, Calif.
- Lynn Crandall, Water Commissioner, Big Lost River, Mackay, Idaho.
- Augustus Griffin, Superintendent of Operation and Maintenance, Eastern Section Block, Department of Natural Resources, Canadian Pacific Railway, Brooks, Alberta, Canada.
- Charles R. Hedke, West Palm Beach, Fla.
- O. W. Israelsen, Professor of Irrigation and Drainage, Utah Agricultural College, Logan, Utah.
- R. I. Meeker, Special Deputy State Engineer, Denver, Colo.
- H. M. Murdock, Agricultural Engineer, Montana Agricultural College, Bozeman, Mont.
- R. L. Parshall, Senior Irrigation Engineer, Department of Agriculture, Fort Collins, Colo.
- W. L. Powers, Chief in Soils, Oregon Agricultural College, Corvallis, Ore.
- G. E. P. Smith, Irrigation Engineer, Arizona Agricultural College, Tucson, Ariz.
- C. L. Waller, Head, Department of Civil Engineering, Washington State College, Pullman, Wash.

\* See Society Affairs, p. 106.

*Committee on Interstate Water Rights.—*

- M. C. Hinderlider, State Engineer, Denver, Colo., *Chairman*.  
George M. Bacon, State Engineer, Salt Lake City, Utah.  
Frank C. Emerson, Governor of Wyoming, Cheyenne, Wyoming.  
C. E. Grunsky, Consulting Engineer, San Francisco, Calif.  
C. S. Heidel, State Engineer, Helena, Mont.  
R. I. Meeker, Deputy State Engineer, Denver, Colo.  
J. C. Stevens, Consulting Hydraulic Engineer, Portland, Ore.

*Committee on Co-Operation Between Federal and State Agencies.—*

- F. C. Scobey, Senior Irrigation Engineer, U. S. Department of Agriculture, Berkeley, Calif., *Chairman*.  
Harold Conkling, Associate Hydraulic Engineer, Division of Water Rights, State Department of Public Works, Alhambra, Calif.  
M. R. Lewis, Head, Department of Agricultural Engineering, University of Idaho, Moscow, Idaho.  
Charles S. Schofield, Senior Agriculturist in Charge, Western Irrigation Agriculture, U. S. Department of Agriculture.  
Fred D. Pyle, Engineer and Manager, Vista Irrigation District, Vista, Calif.

*Committee on Drainage of Irrigated Lands.—*

- Thomas H. Means, Civil Engineer, San Francisco, Calif., *Chairman*.  
J. L. Burkholder, Chief Engineer, Middle Rio Grande Conservancy District, Albuquerque, N. Mex.  
L. M. Holt, Supervising Engineer, U. S. Indian Service, Yakima, Wash.  
H. S. Kleinschmidt, Consulting Engineer, Salt Lake City, Utah.  
L. M. Lawson, Engineer, U. S. Bureau of Reclamation, El Paso, Tex.

*Committee on A National Reclamation Policy.*—In deciding to create this Committee the Executive Committee felt strongly that reclamation matters, particularly in respect of Federal and State relationship thereto, were in a state of transition and uncertainty and that a correct determination of the best governmental policy required the careful consideration of able men entirely familiar with the subject of reclamation. It is a matter of great economic importance and it was thought that no other group of men were so well equipped to contribute constructive thought and correct analyses to these matters as was a group of carefully selected engineers. If the Engineering Profession fails to make such contribution it can expect legislation to proceed along doubtful, if not dangerous, economic lines. The personnel of the Committee is as follows:

- J. B. Lippincott, Consulting Hydraulic Engineer, Los Angeles, Calif., *Chairman*.  
G. M. Bacon, State Engineer, Salt Lake City, Utah.  
W. H. Code, Consulting Engineer, Los Angeles, Calif.  
J. A. Elliott, Manager and Vice-President, Wyoming Development Company, Wheatland, Wyo.  
John E. Field, Consulting Engineer, Denver, Colo.  
C. E. Grunsky, Consulting Engineer, San Francisco, Calif.  
M. C. Hinderlider, State Engineer, Denver, Colo.  
Burton Smith, General Manager, Twin Falls Canal Company, Twin Falls, Idaho. (No acknowledgment.)  
G. E. P. Smith, University of Arizona, Tucson, Ariz.  
J. C. Stevens, Consulting Engineer, Portland, Ore.  
R. K. Tiffany, Supervisor of Hydraulics, Olympia, Wash.

*Committee on Papers and Specifications.*—This Committee was created in accordance with a recommendation of the Board of Direction. It was decided that the most practical personnel of such Committee would be the membership of the Executive Committee, and it was so ordered for 1926. The new Executive Committee, of course, may determine otherwise for 1927. The principal duty of this Committee will be to secure desirable papers for the Division, to review these papers and to make recommendations to the Board of Direction respecting their publication.

At its meeting on July 13, 1926, the Executive Committee, as an expression of its policy concerning Standing Committees, passed a resolution as follows:

"That Standing Committees serve without definite term of office, subject to proper functioning of the Committee as may be determined by the Executive Committee; and, further, that Committee Chairmen shall have considerable discretionary power as to the number and personnel of their committees."

#### COMMITTEE PROGRESS REPORTS

For the Committee on Duty of Water Studies, Professor S. T. Harding, *Chairman*, reports as follows:

"The activity of the Duty of Water Committee during 1926 has been confined to the subject of the consumptive use of water. The preliminary report by Mr. Israelsen was sent to all members of the Committee and to others thought to have data on this subject. They were asked to comment on the report, and to furnish data on values of consumptive use under different conditions. Mr. Israelsen has been engaged in assembling this material for a second report. We expect to have this ready for circulation in the Committee in January, 1927. Further progress will depend on the reactions of the Committee to this report. I do not anticipate that any material additions will be suggested, and expect to have a report of the whole Duty of Water Committee ready to submit to next year's Executive Committee some time in the fore part of 1927."

For the Committee on Interstate Water Rights, M. C. Hinderlider, *Chairman*, reports a number of instances of definite effort and progress in the matter of interstate and international water-right and water-allocation adjustments, the more important of these relating to the Columbia River and Colorado River. Mr. Hinderlider's report is submitted in full.\*

For the Committee on Co-Operation between Federal and State Agencies, F. C. Scobey, *Chairman*, reports that he expects to have ready for the 1927 Annual Convention, to be held in Denver, Colo., an inventory of the many co-operative activities between Federal and State agencies and that this inventory would be the basis for future work and recommendations of the Committee.

For the Committee on Drainage of Irrigated Lands, one of the recently created committees, Thomas H. Means, *Chairman*, reports as follows:

"We are planning to make a report for submission to the Division at its next summer's meeting. While no definite action has been taken, we propose to make a general study of the accomplishments in drainage of irrigated lands and to bring prominently forward the most recent developments in this science."

\* See Society Affairs, p. 106.



For the Committee on "A National Reclamation Policy", a Committee the personnel of which has just been completed, J. B. Lippincott, *Chairman*, reports that he has already circularized the Committee membership with a statement and a brief discussion of the problem before it. He plans an exchange of views of the membership, by correspondence, to be followed, if possible, by an actual meeting of the Committee this summer (1927) at Denver or Salt Lake City, Utah.

#### NOMINATING COMMITTEE

The only other Committee named was the Nominating Committee, as required by the Constitution. The personnel of this Committee was Messrs. John E. Field, *Chairman*; G. Clyde Baldwin, H. D. Comstock, F. C. Herrmann, and J. R. Luper.

The members of the Executive Committee for the ensuing year, as nominated by this Committee, are Messrs. R. I. Meeker, Lyman E. Bishop, George M. Bacon, Lynn Crandall, and Frederick H. Tibbetts.

#### TECHNICAL PROCEDURE COMMITTEE

This is a committee, created by the Board of Direction in 1926, the membership of which includes the President, Secretary, and certain members of the Board of Direction of the Society, as well as the Chairmen of the Executive Committees of the Technical Divisions. The work of this Committee, in general, is to formulate policies respecting the activities of the Technical Divisions for recommendation to the Board of Direction. Thus far the Committee has held two meetings, one at the Spring Meeting of the Society in Kansas City, Mo., in April, and one at the Annual Convention of the Society in Philadelphia, Pa., in October. The Chairman of the Irrigation Division attended both these meetings. Among other important matters considered by the Technical Procedure Committee, the subject of "Manuals" received special attention, as did also the question of policy respecting the number and coordination of meetings of the Technical Divisions.

#### MANUALS

The preparation of papers or detailed texts which might serve as "Manuals" for the many specialized fields of engineering represented by the Technical Divisions was deemed, by the Technical Procedure Committee, as a work of importance that should be earnestly encouraged. To that end the Executive Committees of the Technical Divisions were requested to give consideration to the matter and to prepare a list of suggested subjects for "Manuals" for presentation to the Technical Procedure Committee at its next meeting. In the absence of a regular meeting the Executive Committee of the Irrigation Division has not been able to give full consideration to the subject but, by correspondence, it has suggested a number of possible subjects for "Manuals". Among these may be enumerated the following:

Standardized Methods of Analysis of Water Uses, Particularly in Relation to Consumptive Use, Return Flow, Head-Gate Diversion, Net Duty on the Land, Reservoir Losses, Transmission Losses, etc.

Duty of Water and Methods of Delivery.  
The Design of Canals and Canal Structures.  
Irrigation Construction Costs and Accounting.  
Irrigation Operation and Maintenance Cost and Accounting.  
Hydraulics of Irrigation and Irrigation Structures.  
Pumping Water for Irrigation.  
Drainage of Irrigated Lands.  
Design of Side-Channel Spillways.  
Permissible Canal Velocities.  
Silting of Canals and Storage Basins.  
Dams and Reservoirs.  
Evaporation, Transpiration, and Run-off.  
Dam Failures, Being a Compilation of All Known Dam Failures and a Discussion of Their Causes.

The correspondence relating to this subject, had with members of the Executive Committee, will be forwarded in due time to the new Chairman of the Division for his use in meeting with the Technical Procedure Committee.

#### DIVISION MEETINGS

Regarding the number of meetings to be held annually and the co-ordination of meetings of the various Technical Divisions, the following resolution was adopted by the Technical Procedure Committee at its Philadelphia Meeting:

"That it is the sense of the Committee on Technical Procedure that, in general, with the exception of the Annual Meeting, there be not more than four Divisions holding sessions at any one meeting, and that, excepting its Annual Meeting, no Division hold more than two meetings per year at the time of the regular meetings of the Society."

As far as the Irrigation Division is concerned, and having in mind the scheduled locations for the Quarterly Meetings of the Society for the next three years, the 1926 Executive Committee deemed it not practicable for the Division to hold more than one meeting per year, as follows:

- 1927 (Annual Convention), Denver, Colo.
- 1928 (Spring Meeting), Washington, D. C.
- 1928 (Fall Meeting), San Diego, Calif.

Neither did it seem practicable for the Division to hold its Annual Meeting in New York, N. Y., as formerly provided, and the new Constitution of the Division eliminates this requirement.

#### MEMBERSHIP

During the year, the members of the Executive Committee put out a circular letter to eligible members of the Society suggesting affiliation with the Irrigation Division, with a resultant appreciable increase in membership. The Year Book of the Society for 1926 records a membership of 548, and the membership on December 8, 1926, was 626—an increase of 14 per cent. It is suggested that, immediately preceding or following the list of membership, as published in the Year Book, it would be desirable, hereafter, to list also all Standing Committees of the Division and their personnel.

#### AFFILIATES

Two Division Affiliates were enrolled during the year, Professor W. L. Powers, Chief of Soils, Oregon Agricultural College, Corvallis, Ore., and Professor H. M. Murdock, Agricultural Engineer, Montana Agricultural College, Bozeman, Mont. These gentlemen had been, and still are, serving on the Committee on Duty of Water Studies.

#### COMMITTEE CO-OPERATION

At its July meeting in Seattle, the Executive Committee discussed the matter of co-operation between its Standing Committees and the Society's Special Committee on Irrigation Hydraulics to the end that there be no unnecessary overlapping of work. It was thought by some that this latter Committee might consistently function as one of the Standing Committees of the Irrigation Division and thus more definitely assure co-ordination of committee work. The Executive Committee, however, made no recommendation in the matter other than to suggest an interchange of information as to committees, sub-committees, and their personnel. A list of all Standing Committees of the Irrigation Division was accordingly sent to the Chairman of the Committee on Irrigation Hydraulics.

#### EXPENDITURES

No record of the total annual cost of operating the Irrigation Division is available. It would be of interest to the Executive Committee to know what this cost might be in comparison with that for other Divisions and as a guide in the preparation of future budgets. The local expenditures for stenographic work and postage will scarcely exceed \$125. The expenditures incidental to the Summer Meeting, and the regular expenditures at the Society Headquarters, New York, that are properly chargeable to the Division, are not known, but doubtless are appreciably more than the local expenditures referred to. Expenditures by the Standing Committees of the Division have thus far been negligible. If the Division is to function largely through its Committees, and best results secured, it is believed that more liberal budgetary allowance must be made for Committee work than has heretofore been asked or allowed. It ought to be possible for the more important of these Committees to meet at least once a year and this involves expense. It was with this thought in mind that the 1927 Budget for the Division, submitted in August, 1926, included an item of \$1500 for Committee work. It is anticipated that even larger allowances may be necessary in the future, for the most efficient functioning of the Division's Committees.

Respectfully submitted,

JOSEPH JACOBS, *Chairman,*

G. L. PARKER, *Secretary,*

FRANK C. EMERSON,

S. T. HARDING,

R. I. MEEKER,

*Executive Committee.*

## Progress Reports of Committees of Technical Divisions

### Progress Report of the Committee of the Irrigation Division on Interstate Water Matters

The Compact Method for the apportionment of interstate water rights in the settlement of interstate river disputes, is gaining momentum in every phase of interstate water relations.

Twenty-two States have territory in whole, or in part, west of the Mississippi River. Interstate water compacts concerning eleven of these twenty-two States have been concluded, and additional compacts effecting the water supplies of nine of the eleven remaining States have either been negotiated or proposed.

In the Northwest, representatives of the States of Idaho, Oregon, Washington, and Wyoming are studying interstate phases of the Snake River for a compact adjustment, the Federal Congress having authorized such negotiations and a compact adjustment. The first of these relates to the Columbia River and affects the States of Montana, Idaho, Washington, and Oregon. The respective State Legislatures have also authorized the appointment of representatives or commissioners.

The purpose of this allocation is to clarify the situation and establish the rights of the State of Washington to the quantity of water necessary to develop the Columbia Basin Project. The principal conflict has been between the States of Washington and Idaho due to possible storage in Lake Cœur D'Alene. The Columbia Basin desired to use Lake Pend Oreille and Lake Cœur D'Alene for storage, but as soon as the intention became generally known in Idaho, the Legislature of that State promptly enacted a law withdrawing Lake Cœur D'Alene from appropriation.

The Columbia Basin Project, it is reported, has apparently abandoned any intention to use Lake Cœur D'Alene and is now investigating Pend Oreille Lake for the purpose of determining the feasibility of enlarging the storage there. The Legislature of Idaho made an appropriation of \$15 000 for the purpose of financing the investigation. An appropriation by the United States Government is being used in financing the survey of Lake Pend Oreille, now in progress.

The State of Montana desires to take care of its future requirements for power storage and irrigation development, but has provided no funds for the use of the State Engineer in this respect.

It is anticipated that this Commission will agree upon a compact allocating the Columbia River waters to the respective States and that the compact will be recommended to the Legislature of each interested State and the Federal Congress, for confirmation.

The recent Congress by proper legislation paved the way for treaty agreements between the States of Wyoming, Idaho, Washington, and Oregon, for disposition of the waters of the Snake River. It is believed that the States affected have provided, or undoubtedly will provide, by proper legislation, for the appointment of representatives or a joint board to handle this matter.

In the South a compact concerning the waters of the Canadian River was concluded at Amarillo, Tex., on December 1, 1926, by representatives of the

States of New Mexico, Oklahoma, and Texas, with a semi-official participation by the State of Arkansas. In addition to the apportionment of water among the interested States, the agreement creates a benefit district in each State and provides for an interstate commission under the direction of which the means and costs of river control shall be ascertained, the aggregate cost of the benefits determined, and the allocation of an equitable proportion of such costs of control to the respective benefit districts.

The major purpose of the Canadian River Compact is flood control, irrigation and industrial development being subsidiary considerations. This compact may be considered as an effort to establish an interstate conservancy district on the Canadian River in four States, and from this viewpoint it is an advance step in interstate relations.

The State Engineering Department of North Dakota is making studies of the James River, looking to a possible treaty between North Dakota and South Dakota. Water supply, storage, and sewage sanitation concerning Jamestown, N. Dak., and Huron, S. Dak., are contemplated in this measure.

At present, a compact concerning the waters of the North Platte River Basin affecting Colorado, Wyoming, and Nebraska, is under negotiation. Such negotiations will probably be concluded in January, 1927, in time for submitting the results thereof, in the form of a compact, to the Legislatures of the States affected. A representative of the United States Government is participating in these negotiations.

Conditions in the Colorado River Basin appear encouraging for the ultimate approval of the Seven State Colorado River Compact. During the last two weeks of December, 1926, representatives of Arizona, California, and Nevada have been negotiating for a Tri-State Compact concerning the waters of the Lower Colorado River Basin, and the latest press reports strongly indicate that the result of such negotiations will be favorable.

The settlement of this Lower Basin problem will assure the ratification of the major compact on the Colorado River, since there is no dispute over the water apportionment as between the Upper and Lower Basins.

Threatened interstate litigation on the Rio Grande by the State of New Mexico has been, at least temporarily, deferred by a Court decision in that State, and the prospect for renewal of negotiations between New Mexico, Colorado, and Texas, initiated in 1925, is encouraging.

The Rio Grande interstate problem has numerous aspects involving flood and silt control, drainage of water-logged lands, and storage for irrigation purposes.

While a suit over the use of the waters of the Arkansas River, is pending between certain ditch interests in Kansas and Colorado, the two Compact Commissioners of the two States have prepared a tentative draft for a compact which offers a solution of the problems which have been of long standing between these States, litigation over which has cost the citizens of the two States probably in excess of \$1 000 000.

In the East, engineers representing New Jersey, New York, and Pennsylvania, are working on a compromise plan for a treaty for the division and use of the waters of the Delaware River, a common resource of the three States.



The Delaware River Compact was concluded in New York on January 24, 1925, following legislative enactments in the three States during 1923. The New York Legislature has approved the compact.

The ultimate consummation of this interstate agreement will be a valuable step in interstate relations, because the Delaware River is located in a heavily developed and very populous part of the United States where water uses are manifold and interrelated, and future development is more or less restricted. Problems of municipal water supply, sanitation of sewage and industrial wastes, power, navigation, and storage are all involved.

The State of Utah several years ago enacted the necessary legislation authorizing the State Engineer to co-operate with the State Engineers of border States in the determination, supervision, regulation, and control of all water and water rights on all interstate streams, where such agreements are not in conflict with the provisions of the irrigation and water-right law now in force in that State.

To date no definite agreements under the powers so conferred to the State Engineer of Utah have been entered into. Utah has more streams in common with Wyoming than any of the other border States, but definite agreements between the two States have been deferred, due to the fact that water rights in Wyoming have been adjudicated, while rights on the same interstate stream in Utah have not.

Under the present law the State Engineer of Utah has no authority to initiate adjudications, but he is asking the coming Legislature to give him this authority where interstate streams are effected.

There appears to be no pending litigation or contemplated litigation between the State of Utah and the Federal Government over the waters of interstate streams.

Probably the most important and largely discussed problems affecting the control of interstate rivers, are those of the Colorado River Basin heretofore referred to, since the potentialities of this stream basin constitute the largest undeveloped resource of the nation and affect most vitally the future of a great empire. Even if the so-called Swing-Johnson Bill providing for the construction of a great dam in the Colorado River and an All-American Canal for supplying the Imperial Valley with water, is enacted into law, the major result, so far as all the other States effected are concerned, will be the ratification of a Six-State Compact with provisions for later ratification by the seventh remaining State of Arizona.

If this method of settling this tremendous problem is not successful, through failure of ratification of the compact in some form, the chaotic condition into which this whole matter will be thrown through interstate litigation it is believed will be most disastrous to the needed development of this stream within the near future and probably to the rights of the Upper Basin States.

M. C. HINDERLIDER, *Chairman,*

Committee on Interstate Water Matters.

January 13, 1927.

## Progress Reports of Special Committees of the Society

### Progress Report of the Special Committee on Concrete and Reinforced Concrete Arches\*

TO THE BOARD OF DIRECTION,  
AMERICAN SOCIETY OF CIVIL ENGINEERS:

The Special Committee on Concrete and Reinforced Concrete Arches begs leave to submit the following report of progress:

The work of the Committee during the past year has been concentrated mainly on two projects, the investigation, by means of hard rubber models, of the stresses in skew arches, by George E. Beggs, M. Am. Soc. C. E., Associate Professor of Civil Engineering, Princeton University, and the tests of large sized model arch ribs, by W. M. Wilson, M. Am. Soc. C. E., Research Professor of Structural Engineering, University of Illinois.

#### PIER MOVEMENTS

The observations of pier movements on a number of bridges in various parts of the United States have been continued along the lines indicated in previous Progress Reports.† These data are being collected and will be assembled and analyzed. The work of making these observations is being done by resident engineers at the various bridge sites, with instruments provided by the Committee.

#### CLIMATIC CHANGES

Hardy Cross, M. Am. Soc. C. E., in an article entitled "Temperature Deformations in Concrete Arches,"‡ proposes a study of the effect of climatic changes on concrete arches by noting the rise and fall of the crown of the arch. Data on this variation are being taken on a seven-span, open-spandrel, reinforced concrete arch bridge about 700 ft. long at Columbus, Ohio. These observations were started in the fall of 1925, as noted in the Progress Report for that year,§ and are being continued through the present winter (1926-27).

Similar observations are to be made on a large multiple-arch bridge on which construction has just been commenced, at Ashtabula, Ohio. These observations will be started as soon as the first arch ribs are poured, and will continue until construction is completed. In this way it is believed that valuable information as to the shrinkage and flow or time yield of concrete may be secured. These observations are to be made with the co-operation of the Ohio State Highway Department, George F. Schlesinger, M. Am. Soc. C. E., Director, and Mr. J. R. Burkey, Chief Engineer of Bridges.

\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 130, and March, 1926, Society Affairs, p. 138.

‡ *Engineering News-Record*, February 4, 1926, p. 190.

§ *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 131.

## EFFECTS OF SPANDRELS

At the Summer Meeting of the Society in Seattle, Wash., Professor Beggs presented a short paper before the Structural Division on "Integral Arch Action", in which he described some bridges which have recently been built in France, in the design of which the stiffening effect of the spandrel columns and deck has been taken into account as effecting the stresses in the arch ribs.\* Adolph Buhler, Chief Engineer of the State Railways of Switzerland, has also taken this into account in the design of the recently completed Grand Fey Viaduct. Studies along this line have been made by means of models and the use of deformatometer gauges, for the Committee, by Mr. Charles Tilgner, Jr., of Princeton, N. J., and Mr. D. H. Overman, Assistant Engineer, Ohio State Highway Department. Mr. Tilgner's work was completed in June, 1926, and presented as a thesis for graduation at Princeton University.

Mr. Overman now has his results complete and is preparing a paper on the subject for presentation to the Society. This paper will give a review of the work done in Europe, the results of Mr. Tilgner's work, the results of similar studies which have been made on several bridges by Professor Beggs, and the results of his own investigations. It is proposed by the Committee to make large-sized model tests of arch ribs with and without spandrel and deck, in the laboratory at the University of Illinois Engineering Experiment Station. It was hoped that money could be secured, sufficient to build and test a full-sized system of arch ribs, and if the results of the large specimen tests in the laboratory seem to warrant the expenditure, an effort will be made to secure the necessary funds.

## WORK AT THE UNIVERSITY OF ILLINOIS

A great amount of research work for the Committee has been carried on under the direction of Professor Wilson, at the University of Illinois Engineering Experiment Station. To assist him in this work the Committee established two research assistantships at the University of Illinois.

The first work undertaken by Professor Wilson was the investigation in connection with the Gilbert Street Bridge, in Danville, Ill., described in the Progress Report of the Committee for 1925.† Professor Wilson has the material ready for publication and it will appear shortly.

The laboratory tests of arches‡ that were planned for the 1926 program have been completed. The special equipment devised for these tests is of sufficient interest to justify its description as a part of this report.

The special equipment, which was used in conjunction with a 300 000-lb. screw-type testing machine, is illustrated in Fig. 1. This equipment was of such character that the abutments could either be held in position or moved at will, and means were provided for measuring the magnitude of the hori-

\* "Cours de Béton Armé," Prof. A. Mesnager, p. 14; *Der Bauingenieur*, June 1, 1926, Heft 19, p. 387.

† *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 131.

‡ This experimental work was done by the Engineering Experiment Station of the University of Illinois. The direct expense of the tests was paid from funds provided by the Committee.



zontal thrust and for determining the position as well as the magnitude of the vertical reaction.

The abutment, *L4*, is a steel casting with a body 14 in. wide at the portion receiving the arch and an arm extending outward. The body is supported on a knife-edge bearing on the top of the casting, *L5*; and the outer end of the arm is supported on a knife-edge bearing on the top of a plate resting on a jack. The casting, *L5*, rests upon steel rollers, and the top of the jack and the plate resting on it have lubricated polished surfaces so that the supports of the abutment, *L4*, are incapable of offering any horizontal resistance. The portion of the load transmitted through the casting, *L5*, is weighed by the testing machine and the portion that goes through the jack is weighed by the scales.

The horizontal thrust is taken by the tie-rods, *TR1*, one on each side of the arch. The thrust is delivered to the steel block, *B6*, thence through knife-edges to the steel block, *B5*, which rests against the concrete abutment. The magnitude of the thrust is measured by extensometers attached to the rods and having a gauge length of 12 ft.

The load is delivered to the arch through the system of levers and hangers shown in the diagram. The head of the testing machine has an extension, *A*, that bears on a casting, *C*, bolted between the two large I-beams, *B*. The load is transmitted through the pin, *P*, to the system of levers and hangers. All contacts are either knife-edges or hardened steel balls. The levers are so proportioned that the thrust line lies within the middle third of the arch over its entire length. The knife-edges at the top and the bottom of the hangers, *HR1*, *HR2*, and *HR3*, are parallel to the plane of the arch rib so that the hangers cannot exert any horizontal pressure on or resistance to the rib, and the latter is actually without lateral support over its entire length.

The distance between abutments was measured by Ames dials attached to steel rods extending from one abutment to the other. This distance could be changed by turning the nuts on the ends of the tie-rods. Thus, the change in the span resulting from the change in the load could be measured, the span could be brought back to its original value or could be varied any predetermined amount, as desired. The angular position of the concrete abutments was determined by level-bars set on the rib at the intersection of the center line of the tie-rods and the center line of the abutment. The angular position of the abutment could be changed by the jack. Thus, rotation of the abutment incident to increasing the load could be noted, or any desired rotation could be produced. With this apparatus the reactions could be completely found so that the structure as a whole was as determinate as a simple beam. The moment, shear, and thrust could thus be ascertained accurately at any section. In addition, a complete set of strain-gauge readings was taken midway between each pair of adjacent loading points.

The apparatus as described was used in making an experimental study of five questions, as follows:

1.—What effect does changing the slenderness ratio (ratio of unsupported length to the width) have on the unit strength of an arch?



2.—Does spiral reinforcement increase the strength of an arch rib?

3.—Do the measured and computed values of the reactions on the abutments agree?

4.—Does the flow of concrete relieve the stresses resulting from movements of the abutments?

5.—What is the relation between the unit strength that a concrete will develop in an arch and the unit strength that the same concrete will develop in a control cylinder?

All the arches used in these tests had the same profile and all had the same percentage of longitudinal reinforcement. They were 5 in. deep at the crown and about 10 in. deep at the abutments.

Four arches were used in the series to determine the effect of the slenderness ratio on the unit strength of a rib, their widths being 8,  $6\frac{1}{2}$ ,  $4\frac{1}{2}$ , and  $3\frac{1}{2}$  in., respectively. The length of the rib from abutment to abutment, measured along the arch axis was 19 ft.  $10\frac{1}{4}$  in. The slenderness ratio and the strength per inch-width developed by the four arches is given in Table 1.

TABLE 1.—EFFECT OF SLENDERNESS RATIO UPON STRENGTH OF A REINFORCED CONCRETE ARCH RIB.

Arch No.	Width of rib, in inches.	Ratio of length to width of rib.	Ultimate strength of rib, in pounds per inch-width.
26-1	8	29.8	24 230
26-2	$6\frac{1}{2}$	38.9	25 000
26-3	$4\frac{1}{2}$	53.0	18 840
26-4	$3\frac{1}{2}$	76.2	21 020

The three widest arches failed by typical compression failures; the slenderest one failed by buckling. Although the arch,  $4\frac{1}{2}$  in. wide, had a typical compression failure, the lateral movement at the crown increased rapidly with the load when the load was nearing the ultimate and the tendency to buckle undoubtedly reduced the maximum load that the arch could carry.

The strength developed by all these arches is remarkable considering the slenderness ratios. The fact should be borne in mind, however, that the abutments were carefully adjusted after each increment of load so that a fixed-end condition actually existed. A very slight rotation of the abutments about a vertical axis probably would have materially reduced the ultimate load.

Four arches, each  $6\frac{1}{2}$  in. wide, were used in the tests to determine the value of spiral reinforcement for arch ribs; two arches had longitudinal reinforcement only, the other two had an equal amount of longitudinal reinforcement and, in addition, had spiral reinforcement consisting of  $\frac{1}{4}$ -in., round rods made into a spiral having a 1-in. pitch and a diameter as large as the section of the arch would permit. Tests of these arches indicated that the spiral reinforcement did not increase the strength of the rib in the least.

Measurements were taken on practically all arches tested in order that a comparison might be made between the measured and computed values of the

reactions and, when the computed values were corrected for rib-shortening, the two were found to be in almost perfect agreement.

The results of the test to determine the effect of the flow of concrete on the stresses resulting from movements of the abutments have not been analyzed.

Data from a number of tests were available for comparing the strength developed by concrete in an arch, with that developed by the same concrete in a control cylinder. The average of all the tests showed that the concrete developed practically the same strength in the rib that it does in a 6 by 12-in. cylinder.

These statements give the high points in these tests. A complete report will appear in the forthcoming *Bulletin* of the Engineering Experiment Station of the University of Illinois.

#### PROPOSED LABORATORY TESTS OF ARCHES

Two series of laboratory tests of arches are planned for 1927: (1) Tests to determine the effect of partial loading; and (2) tests of structures consisting of a reinforced concrete rib, spandrel columns, and a deck.

All the arches tested in 1926 were loaded so that the thrust line fell within the middle third of the rib over its entire length. Similar arches will be constructed during 1927 that will be loaded over one-half the span only, so that the thrust line will fall outside the middle third of the rib, thus producing tension on a portion of some sections. These arches will be in every way a replica of those tested with loads over their entire length.

The structures tested in 1926 consisted of arch ribs without superstructures. Composite structures consisting of a rib, spandrel columns, and a deck will be tested during the coming year (1927). The ribs of these arches will be duplicates of the ribs used in tests that have already been made.

*Skew Arches.*—As noted in the 1925 report\* of the Committee, Professor Beggs has been carrying on an investigation of the stresses in skew arches.

Four models were cast, of hard rubber. These have been used in three dimensions, similar to the two-dimension celluloid and paper models used in connection with the Beggs deformatometer gauges. The movements of the abutments are introduced by means of turnbuckles and the resulting deformations measured by Ames dials, measuring to 0.001 in. At several points greater accuracy was desired and 0.0001-in. dials were obtained. The Committee is indebted to the B. C. Ames Company, of Waltham, Mass., for the loan of twenty-four Ames dials for this work. Other dials were also borrowed from the University of Illinois and the Ohio State University.

The dimensions of the models were made exactly one-fourth those of the skew arches tested by the U. S. Bureau of Public Roads. Two angles of skew have been used, 30° and 60°, and duplicate models of each skew have been obtained. To date, work has been done only on one 30° skew model. This model has a span of 21 in. parallel to the center line of roadway, a rise of  $4\frac{13}{64}$  in., and a width of  $13\frac{1}{2}$  in. Before concluding work on this model,

\* *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 132.

it is proposed to saw strips off the edges, making the widths, successively,  $13\frac{1}{2}$ ,  $9\frac{3}{4}$ , and  $6\frac{3}{4}$  in.

J. Charles Rathbun, M. Am. Soc. C. E., in his paper entitled "Analysis of the Stresses in the Ring of a Concrete Skew Arch",\* gives a mathematical solution for the stresses in a skew arch, and the Committee requested Professor Rathbun to calculate by his method the reactions on the model which is being tested. Professor Rathbun has consented to do this and met with the Committee at its last meeting in June, 1926, at Princeton University, and presented the first preliminary figures on the model  $13\frac{1}{2}$  in. wide.

In general it may be said, at this time, that the method of model deformation seems to be eminently suited to the solution of this complicated problem, and the results already obtained are very illuminating. It is hoped that with the aid of the theoretical solutions presented by Professor Rathbun and the testing of the remaining models, the Committee may be able to present a practical solution for the skew barrel arch.

#### FUTURE WORK

The Committee calls attention to the statement of the work which it deems necessary before a final report is made to the Society, which was printed in the Progress Report for 1925,† and again wishes to report progress.

Respectfully submitted,

CLYDE T. MORRIS, *Chairman*,  
E. H. HARDER,  
A. C. JANNI,  
W. M. WILSON,  
GEORGE E. BEGGS, *Secretary*.

December 20, 1926.

\* *Transactions*, Am. Soc. C. E., Vol. LXXXVII (1924), p. 611.

† *Proceedings*, Am. Soc. C. E., March, 1926, Society Affairs, p. 143.

### Progress Report of the Special Committee on Flood-Protection Data\*

TO THE BOARD OF DIRECTION,  
AMERICAN SOCIETY OF CIVIL ENGINEERS:

In its previous reports† the Committee has stated the necessity for the employment of an experienced engineer to devote his full time to the work of compiling and analyzing the data relating to floods, if the Committee is to accomplish the work for which it was created by the Board of Direction. For the salary of this engineer and for stenographic work, typing, travel, postage, and miscellaneous expenses, it has been estimated that \$10 000 a year would be needed and that the work should be continued on that scale, probably for two years, until the final report of the Committee could be prepared.

During the last year (1926) the efforts of the Committee have been directed to obtaining this money, but without success. Unless the Committee can be properly financed, it can probably not continue to be of service to the Society.

In order that the Board of Direction and the Society may have a basis for decision as to the desirability of continuing the Committee, a brief statement of facts is presented.

There is a great mass of available data relating to floods, especially within the limits of the United States. By far the largest part of this mass of information is contained in the published reports and unpublished files of the United States Geological Survey. Other records are contained in reports by States and municipalities, published officially or in the current engineering press, and in miscellaneous records published in the engineering and daily press.

The late E. Kuichling, M. Am. Soc. C. E., in his discussion of the paper by Weston E. Fuller, M. Am. Soc. C. E., on "Flood Flows",‡ presented a compiled table of maximum flood records, which has been widely used. C. S. Jarvis, M. Am. Soc. C. E., in a paper entitled "Flood Flow Characteristics,"§ has revised, expanded, and brought up to date the Kuichling table and has presented a new compilation that is believed to include the best data now available of maximum observed flood discharges. However, records of the thousands of floods below the maxima are needed in studies of flood frequency, but of course do not appear in this table of maximum discharges, nor does the table contain records of stage or duration, which should be available for use in connection with many engineering projects.

Methods of analysis of flood records have been presented by Mr. Weston E. Fuller in his paper on "Flood Flows"|| and by several engineers who have discussed this paper. More recently the engineers of the Miami Conservancy District have studied flood discharges and have published the results of their

\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 135, and March, 1926, Society Affairs, p. 134.

‡ *Transactions*, Am. Soc. C. E., Vol. LXXVII (1914), pp. 643-663.

§ *Loc. cit.*, Vol. 89 (1926), pp. 985-1032.

|| *Loc. cit.*, Vol. LXXVII (1914), pp. 564-617.

work in the reports\* of the District. Adolph F. Meyer, M. Am. Soc. C. E., in "The Elements of Hydrology,"† has discussed floods, their causes and characteristics, and the methods of analyzing and presenting the data. Still later, the Department of Public Works of California‡ has made an elaborate study of flood discharges in that State, which is especially interesting to engineers in all sections of the country because of the methods used in making the study and presenting the report. Fuller, and the engineers who discussed his paper, also Meyer, in "The Elements of Hydrology", emphasized the necessity for introducing the time element into the study of floods, in order that the frequency or periodicity of floods of different magnitudes may be predicted and their dangers evaluated in connection with engineering development. The engineers of the Department of Public Works of California have studied the floods of the rivers of that State with respect to both magnitude and time, and the diagrams published in their report present probably the best picture of probable frequency of flood discharges that has ever been prepared for so large a region.

Mr. Jarvis, in his paper on "Flood Flow Characteristics", approached the study of floods from the point of view of the highway engineer who must design bridge and culvert openings. For this purpose he made diagrams and formulas that could be used for various rivers or regions as a basis for estimating probable maximum flood discharges, generally without respect to their frequency. Except for general statements as to frequency he had nothing to contribute to this phase of the problem, and his methods did not develop the relation of the time element, but were based almost entirely on the magnitudes of maximum floods for given periods. In the discussion of his paper the importance of the time element was emphasized by several members of the Society, who urged the necessity for a thorough-going study of flood characteristics, with reference not only to quantities of flow, but to stages of flow and to the frequency of different stages and quantities.

The situation at the present time, therefore, is that an enormous mass of flood data is available for analysis, methods of analyzing the data with reference to magnitude and frequency have been developed, and graphic methods of presenting the data for ready use have been devised, but the great task of a nation-wide study of these data and their compilation in some systematic form for practical use has not been attempted, nor is there any indication that any individual, corporation, or Government bureau is equipped for this task. As a result each engineer must make his own studies of floods, duplicating, perhaps, the individual efforts of other engineers who may have been over the same ground in connection with the same or other problems, in the same or adjoining regions. The results of the efforts of each engineer are, therefore, generally lost so far as other engineers are concerned. There is a vast duplication of work and in many studies only a small part of the available information is used, and the costs of each study are unnecessarily high. The taxpayer who pays for flood control cannot understand why he must pay also

\* The Miami Conservancy District; Technical Reports, Pts. I, V, VII, and VIII.

† Pub. by John Wiley & Sons, pp. 308-357.

‡ Bulletin 5, "Flow in California Streams."



for general studies of this sort, which from their broad applicability should apparently be undertaken at public expense, so that the results could be made available for use by any practicing engineer.

Because flood damages are increasing there is a mistaken notion that floods are increasing in both magnitude and frequency. The increase in flood damage is, of course, primarily due to the increasing use of rivers, river banks, and river valleys for cities, towns, industrial plants, bridges, railroads, highways, etc., and the consequent greater exposure of lives and property to the flood hazard. In this, as in many other problems related to the country's growth, the engineer is expected to ascertain how safety may be obtained at a minimum cost, and he must also determine how damages may be avoided without the abandonment of the rivers and valleys. The basis for this determination must lie in the proper use of records of floods of the past. These records therefore must be put into shape for intelligent and convenient use by the members of the Engineering Profession.

The Committee has considered, as indicated in its report for 1924,\* that the scope of its duties as implied by its title properly covered two fields:

(1) To collect data pertaining to stage, discharge, and frequency of floods for a large number of streams, and to condense these data in such form as to be of maximum utility to the profession.

(2) To compile descriptions of the various flood-protection systems now in operation and to make this information available to the profession in convenient form for reference.

The Committee has undertaken the first of these tasks and has prepared forms† for use in compiling and studying records of floods. From the data so compiled, the Committee expects to be able to present data showing stage, magnitude, and duration of floods on many streams, and diagrams showing the probable frequency of floods of different magnitudes. The work of compiling and analyzing these flood data is extensive and exacting. It involves not only a study of the reports and files of the U. S. Geological Survey, but a thorough search of engineering literature, newspaper files, and official and unofficial correspondence, and, finally and most difficult, the running down of local records and traditions of times and stages of the great floods of the past. It is believed that only by means of the continuous service of an interested and competent engineer can this enormous work be accomplished. The results are of nation-wide interest and importance. The problems are outlined, the task is great, and the results to be accomplished are both of unusual and outstanding importance to engineers and of immeasurable benefit to the public, which under present conditions must pay not only the costs of individual and perhaps overlapping investigations, but the costs of project works that either are needlessly safe or fall short of giving complete protection because of the inability of the engineers to secure all necessary data within a reasonable time and at reasonable cost.

In urging the Society to undertake this work the Committee feels that it is in essentially the same class as the research work that is being done by

\* *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 135.

† *Transactions*, Am. Soc. C. E., Vol. 89 (1926), p. 1065.

other Special Committees of the Society. Engineers and Governmental agencies, in the past, have made studies of cement, concrete, steel, and other subjects, but in each such study it has required the labor of a specially appointed committee to analyze and crystallize the data in shape for the safe and permanent use of the profession. The time has arrived, in the estimation of this Committee, when flood data should be likewise compiled and analyzed in suitable form for permanent reference, and this should be done by competent authority, working under the direction of the Society, thus performing an inestimable service that cannot be furnished by any individual or Government bureau.

It is urged that the Society take such action as may promptly accomplish the work recommended by this Committee, and that if need be financial assistance be procured from outside sources.

Respectfully submitted,

N. C. GROVER, *Chairman*,  
C. B. BURDICK,  
WILLIAM P. CREAGER,  
H. P. EDDY,  
GERARD H. MATTHES,  
CHARLES H. PAUL,  
A. O. RIDGWAY.

December 13, 1926.

**Progress Report of the  
Special Committee on Impact in Highway Bridges\***

TO THE BOARD OF DIRECTION,

OF THE AMERICAN SOCIETY OF CIVIL ENGINEERS:

The Special Committee on Impact in Highway Bridges submits a brief report of progress at this time.

Since last year's report† was prepared, an outstanding article has appeared on motor truck impact‡. This article makes a substantial contribution to the work of the Committee. This contribution will be very much greater after a few more experiments have been made to establish the relationship between the impact upon pavements and upon bridge floors of various types.

The studies made during the past year on old and new data disclose no considerable changes in impact values from those in the 1926 report. They indicate, however, that with the additional data in sight, much more definite conclusions will be possible. It is hoped that these conclusions may be presented at the Annual Meeting in 1928.

Respectfully submitted,

Special Committee on Impact in Highway Bridges,

A. H. FULLER, *Chairman*,

ARTHUR R. EITZEN,

E. F. KELLEY,

F. E. TURNEAURE.

January 6, 1927.

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\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., March, 1926, Papers and Discussions, p. 442.

‡ "Motor Truck Impact as Affected by Tires, Other Truck Factors, and Road Roughness," *Public Roads*, June, 1926; Report of Co-Operative Tests by the U. S. Bureau of Public Roads, the Society of Automotive Engineers, and the Rubber Association of America, by James A. Buchanan, Bureau of Public Roads, and J. W. Reid, Rubber Association of America.

## Progress Report of the Special Committee on Irrigation Hydraulics\*

TO THE BOARD OF DIRECTION

AMERICAN SOCIETY OF CIVIL ENGINEERS:

GENTLEMEN.—The Committee's work during the past year (1926) has been a continuation of that outlined in previous reports.† A mass of data is accumulating on each of the subjects under investigation. Some of these data have been presented in the form of original papers which the Committee has recommended be published by the Society in order to elicit discussion. Four such papers were presented through the Committee last year‡ and published by the Society. They have brought forth very valuable discussion which will aid the Committee greatly in formulating its Final Report on these subjects. Other data have been presented with the Committee's annual progress reports.§

The Committee has under investigation ten subjects, each of which is assigned to a sub-committee. Engineers not members of the Committee but having special facilities for research or possessing special knowledge of certain subjects have been asked to serve as co-operating members of the various sub-committees. The list of subjects and sub-committees follows:

*I.—Evaporation Losses from Reservoirs.* Sub-Committee: F. C. Scobey, R. L. Parshall, and A. L. Sonderegger; co-operating member, Ivan E. Houk, M. Am. Soc. C. E.

*I (A).—Evaporation from Soils.* Sub-Committee: Franklin Thomas, A. L. Sonderegger, and R. L. Parshall; co-operating members: Ivan E. Houk, M. Am. Soc. C. E., and H. F. Blaney, Assoc. M. Am. Soc. C. E.

*II.—Losses in Canal Conversions.* Sub-Committee: J. L. Savage, J. C. Stevens, F. C. Scobey, and R. A. Monroe.

*III.—Water Movement and Pressure Under Dams.* Sub-Committee: J. L. Savage, R. A. Monroe, and B. A. Etcheverry; co-operating members: E. L. Chandler, M. Am. Soc. C. E., and R. D. Hubbard, Engineer, U. S. Bureau of Reclamation, Denver, Colo.

*IV.—Losses in Siphon Spillways.* Sub-Committee: F. C. Scobey, Franklin Thomas, and A. L. Sonderegger.

*V.—The Silt Problem.* Sub-Committee: Franklin Thomas and B. A. Etcheverry; co-operating member, Ivan E. Houk, M. Am. Soc. C. E.

*VI.—Chutes and Drops.* Sub-Committee: Julian Hinds; co-operating member, A. T. Mitchelson, Irrigation Engineer, Division of

\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., March, 1924, Society Affairs, p. 238; March, 1925, Society Affairs, p. 137; and March, 1926, Society Affairs, p. 242.

‡ (1) "The Improved Venturi Flume," by Ralph L. Parshall, Assoc. M. Am. Soc. C. E.; (2) "Side Channel Spillways," by Julian Hinds, M. Am. Soc. C. E.; (3) "Permissible Canal Velocities," by Samuel Fortier and Fred C. Scobey, Members, Am. Soc. C. E., *Transactions*, Am. Soc. C. E., Vol. 89 (1926), pp. 841, 881, and 940, respectively; and "Evaporation on United States Reclamation Projects," by Ivan E. Houk, M. Am. Soc. C. E., *Proceedings*, Am. Soc. C. E., January, 1926, Papers and Discussions, p. 41.

§ "Report on the Silt Problem," by Fred D. Pyle and Franklin Thomas, Members, Am. Soc. C. E. (with additions by the Committee), *Proceedings*, Am. Soc. C. E., March, 1925, Society Affairs, p. 141; and Bibliography on Subjects Selected for Research by the Special Committee on Irrigation Hydraulics, p. 147.

Agricultural Engineering, U. S. Department of Agriculture, Berkeley, Calif.

VII.—*Scouring Below Dams.* Sub-Committee: R. A. Monroe and B. A. Etcheverry; co-operating members: I. C. Steele, P. O. Crawford, H. E. Gruner, Members, Am. Soc. C. E., and W. H. Nalder, Assoc. M. Am. Soc. C. E.

VIII.—*Measuring Irrigation Deliveries.* Sub-Committee: R. L. Parshall, J. C. Stevens, and Julian Hinds.

IX.—*The Design of Side Channel Spillways.* Sub-Committee: J. L. Savage, Julian Hinds, R. A. Monroe, and B. A. Etcheverry.

#### STATUS OF INVESTIGATIONS BY SUBJECTS

I.—*Evaporation Losses from Reservoirs.*—The U. S. Department of Agriculture at its Hydraulic Laboratory\* at Fort Collins, Colo., has just finished remodeling its reservoir for the purpose of obtaining evaporation data from a large water surface. This reservoir is 84 ft. in diameter with an exposed surface of 5 600 sq. ft. It has recently been provided with a copper lining so as to eliminate all leakage. A complete equipment of recording and indicating instruments for the determination of temperatures, wind velocities, humidity, and sun's radiation, has been installed in addition to that necessary for determination of evaporation from the reservoir and from standard floating and land pans.

Observations began September 15, 1926, and are being taken at 6-hour intervals. This work is under the direction of R. L. Parshall, Assoc. M. Am. Soc. C. E.

The Committee has secured the co-operation of the Middle Rio Grande Conservancy District and the U. S. Bureau of Reclamation in the measurement of evaporation from soil and water surfaces in connection with the co-operative investigations of the water supply for the Middle Rio Grande Project in New Mexico. An evaporation station has been installed at Los Griegos, near Albuquerque, N. Mex., equipped with five tanks for measuring soil evaporation, two tanks for measuring water surface evaporation, maximum and minimum thermometers, rain gauge, and anemometer. A sling psychrometer is also furnished the observer for measuring the relative humidity in connection with his measurements of evaporation, temperature, wind velocity, and rainfall.

The U. S. Bureau of Reclamation has recently awarded contract for the Stony Gorge Dam on the Orland Project, California, with date of completion October 31, 1928. The completion of this dam will greatly facilitate the evaporation investigations proposed by the Committee at the East Park Reservoir on the same project.

Plans have also been completed for obtaining evaporation losses from the San Dieguito Reservoir, near San Diego, Calif. This reservoir is believed to be tight and provisions have been made for measuring the evaporation directly and comparing it with that indicated by floating and land pans. Observations began September 1, 1926. This work is under the direction of F. C. Scobey, M. Am. Soc. C. E.

\* Described as originally built in *Engineering News*, October 2, 1913.



*I (A).—Evaporation from Soils.*—The U. S. Department of Agriculture is conducting experiments on the evaporation from moist soils at its Fort Collins Laboratory. A battery of eighteen soil tanks is used, from which the evaporation from various types of soils with varying degrees of moisture is being determined. A progress report of this work to date has been prepared by Mr. Parshall, under whose direction this work is being done. The report will shortly appear in the *Journal of Agricultural Research*.

Mention has been made under Subject I, Evaporation from Reservoirs, of the co-operative work on evaporation from the soils and water surfaces in the Rio Grande Valley near Albuquerque, N. Mex.

A. L. Sonderegger, M. Am. Soc. C. E., is preparing a paper on soil and rain characteristics in Southern California, including an analysis of two topographically closed basins in which evaporation from soils becomes an important factor.

A series of tests has been inaugurated on the campus of the California Institute of Technology, and at other near-by locations, to determine the absorption of soils both when the water accrues exclusively from rainfall and also when water is applied by irrigation. Two Senior students of the Institute have taken this problem as a thesis and will have the benefit of the co-operation of Harry F. Blaney, Assoc. M. Am. Soc. C. E.

*II.—Losses in Canal Conversions.*—A paper entitled, "The Hydraulic Design of Flume and Siphon Transitions" by Julian Hinds, M. Am. Soc. C. E., has been submitted to the Committee and has been recommended by the Committee for publication by the Society. This paper outlines the past practice of the U. S. Bureau of Reclamation in the design of flume and siphon conversion sections. It contains the results of experiments on existing structures showing their behavior in service.

The Committee has received a paper entitled, "Experiments on the Flow Through Flume Transitions," a thesis prepared in the College of Civil Engineering, University of California, May, 1926, by Philip F. Thayer and J. Perry Yates, candidates for the degree of Bachelor of Science in Civil Engineering, B. A. Etcheverry and F. C. Scobey, Members, Am. Soc. C. E., acting in the capacity of Advisers. A synopsis of this paper is presented in Appendix A.

A series of 832 experiments on expanding conversions in which velocities were above the critical, were made by Messrs. Samuel Finlay and Jorge Altamirano as a thesis for the degree of Civil Engineer in the Catholic University of Santiago, Chile. An extract of this paper\* has been received by the Committee. A request has been made to the authors for more detailed information.

*III.—Water Movement and Pressure Under Dams.*—A paper by Mr. Hinds, entitled, "Upward Pressures Under Dams," has been secured by the Committee and is recommended for publication by the Society. This paper gives the results of uplift measurements on three gravity-type diversion dams, viz.,

\* "Pérdida de carga por ensanches en canales no torrentosos," por Senores Samuel Finlay y Jorge Altamirano, Universidad Católico de Chile, Santiago, 1926.

Colorado River Dam, Grand Valley Project, Colorado; Percha Dam, Rio Grande Project, New Mexico; and the Willwood Dam, Shoshone Project, Wyoming.

The U. S. Bureau of Reclamation has recently awarded contract for the Gibson Dam, Sun River Project, Montana, with time of completion June 30, 1929. This dam is designed as a concrete arch with a portion of the water load carried by gravity cantilever action, this action being affected by uplift. The Bureau of Reclamation expects to test the uplift assumption used in the design of this dam by making actual measurements of the uplift pressures. These data will be available to the Committee after the dam is completed and the reservoir filled.

The American Falls Dam at American Falls, Idaho, will be completed by the Bureau of Reclamation during the coming winter ready for storage of next year's run-off. The measurement of uplift pressures for which pipes have been installed will therefore be started at this dam in the near future.

*IV.—Losses in Siphon Spillways.*—Small metal siphons have been built for laboratory experiments at the California Institute of Technology. Two Senior students are preparing a thesis on this subject, using the results of these experiments. This work is under the direction of Franklin Thomas, M. Am. Soc. C. E.

During the past season (1926) a series of experiments were made on the siphon spillways of the Yuma Project of the U. S. Bureau of Reclamation. The results are being prepared for publication.

It is planned to have piezometer pipes installed in certain siphons now under construction in order that their behavior in service and the losses therein may be more readily determined.

*V.—The Silt Problem.*—The Committee is in receipt of a paper entitled, "Silting of Reservoirs, Studies by Engineers, with Bibliography", by Kirk Bryan, Geologist U. S. Geological Survey. An abstract of this paper is presented as Appendix B.

The rate of silting of the Elephant Butte Reservoir of the U. S. Bureau of Reclamation is being carefully determined. Enough data have been secured for a preliminary report on this subject and the Committee is endeavoring to have such a report prepared for publication in the near future.

*VI.—Chutes and Drops.*—It was hoped that certain allotments by the U. S. Department of Agriculture and the U. S. Bureau of Reclamation could be secured for a co-operative study of the behavior of existing structures. To the present time, however, no funds for this purpose have been made available, hence the Committee can report no progress on this subject.

*VII.—Scouring Below Dams.*—A paper by I. C. Steele and R. A. Monroe, Members, Am. Soc. C. E., entitled, "Baffle Pier Experiments on Models of Pit No. 3 and Pit No. 4 Dams of Pacific Gas and Electric Company," has been presented to the Committee and the Committee has recommended its publication in *Proceedings*. This is a very valuable paper which it is expected will

be supplemented at some later date by a paper on the actual behavior of these dams under flood flows, in order to determine the effectiveness of the baffle piers built on the aprons of these dams in preventing scour below.

The U. S. Bureau of Reclamation has made surveys to determine the erosion below four different dams as follows:

- (a) Jackson Lake Dam in Wyoming. Concrete gravity overflow section about 40 ft. high with seventeen 8 ft. by 7 ft. 10 in. and two 10 ft. by 7 ft. 10 in. radial gates on spillway crest and twenty 8 ft. by 6 ft. 6 in. sluice-gates in base of dam. Dam founded on soft rock. Soundings available for years 1921, 1922, 1924, 1925, and 1926.
- (b) Dodson Dam, Milk River Project, Montana. Timber crib overflow section about 20 ft. high founded on sand and gravel. Soundings available for years 1920, 1922, 1923, 1924, 1925, and 1926.
- (c) Vandalia Dam, Milk River Project, Montana. Amberson overflow section with floor. Dam about 32 ft. high, founded on sand. Soundings available for years 1918, 1919, 1921, 1922, and 1923.
- (d) Lower Yellowstone Dam, Lower Yellowstone Project, Montana. Timber crib overflow section about 6 ft. high, founded on sand and gravel with sheet-piling driven to clay. Soundings available for year 1923.

A paper by W. H. Nalder, Assoc. M. Am. Soc. C. E., describing the results of these investigations will be available to the Committee probably at the time of its next meeting.

The Committee has received an elaborate thesis on the "Scouring Effect of Water Below Dams," by I. Neudatchin, a Senior at the University of California, prepared under the direction of Professor Etcheverry.

As stated in the introduction, the object of the paper is to present the data collected regarding this subject. All the data and experiments presented have been previously published either in foreign or American publications and largely within the last decade.

Chapter I is an historical review. In this chapter the data presented are briefly and chronologically mentioned and the nature and extent of each set of experiments briefly described.

In Chapter II, all the experiments and records mentioned in Chapter I are taken up in chronological order and described in detail:

- (a) By Bidone on the hydraulic jump.
- (b) By Darcy and Bazin on the hydraulic jump.
- (c) By R. Ferriday on the hydraulic jump.
- (d) By Professor A. H. Gibson on the hydraulic jump.
- (e) By B. A. Bakhmeteff, M. Am. Soc. C. E., on the hydraulic jump.
- (f) By R. M. Riegel, M. Am. Soc. C. E., and Mr. J. C. Beebe for the Miami Conservancy District on the hydraulic jump and other means of reducing the erosive effects of large flows of water discharged at high velocities into natural river channels.
- (g) By H. E. Gruner, M. Am. Soc. C. E., and Mr. E. Locker on the results obtained by the use of the so-called "raft spring" or floating apron to reduce scour below dams.

- (h) By Professor Th. Rehbock on the use of a "bucket" in the down-stream aprons of dams.
- (i) By R. W. Gausmann, M. Am. Soc. C. E. and C. M. Madden, Assoc. M. Am. Soc. C. E., in connection with the design of the Gilboa Dam on stepped waterways.
- (j) Observations by A. Meyer, M. Am. Soc. C. E., on ogee weirs and weirs with buckets in their down-stream aprons.
- (k) By E. Fröhlich on model of weir at power plant of Augst-Wyhlen.
- (l) By Professor Th. Rehbock on the dental weir.
- (m) By I. C. Steele, M. Am. Soc. C. E., for the Pitt River No. 3 Dam on baffle piers.

Chapter III consists largely of complicated mathematical formulas which cover in turn:

- (a) General theory of flow in channels.
- (b) The theory of the jump.
- (c) Losses in a jump.
- (d) The undershot flow and the jump.
- (e) The overfall flow and the jump.
- (f) The submerging of the jump.
- (g) Practical applications.

The paper on the whole is evidently a very creditable and painstaking effort to collect in logical form the available data on the subject and to develop the theory and application of the hydraulic jump to the problem.

*VIII.—Measuring Irrigation Deliveries.*—Experimental work has been continued at the Fort Collins Hydraulic Laboratory on various types of open channel measuring devices. The Improved Venturi Flume\* has been the subject of additional investigation and experiment, as well as an open straight-sided flume with a single hump in the bottom, which has been designated as the "Critical Depth Flow Meter." The results of experiments on the latter are being studied with a view to improvements in the device and their ultimate publication.

The Committee is endeavoring to secure a simple inexpensive device for open channels whereby flows from the smallest farm lateral to the larger canals may be readily determined without appreciable loss of head.

*IX.—Design of Side Channel Spillways.*—The Committee has received a discussion by W. H. R. Nimmo, Assoc. M. Am. Soc. C. E., of Mr. Hinds' paper on "Side Channel Spillways,"† which was received too late for publication. Mr. Nimmo's discussion describes a spillway structure involving a problem similar to that described by Mr. Hinds, except that the flow is outward from the channel, the purpose being to waste excess water and limit the flow into canals at times of river flood.

The Committee has suggested that the author re-draft this discussion and re-submit it for publication in *Proceedings* as an original paper.

In its report for 1925, the Committee outlined a series of experiments on the losses involved when two streams intersect at right angles.‡ The experi-

\* "The Improved Venturi Flume," by Ralph L. Parshall, Assoc. M. Am. Soc. C. E., *Transactions, Am. Soc. C. E.*, Vol. 89 (1926), p. 841.

† "Side Channel Spillways," by Julian Hinds, *Transactions, Am. Soc. C. E.*, Vol. 89 (1926), p. 881.

‡ *Proceedings, Am. Soc. C. E.*, March, 1926, Society Affairs, p. 244.

ments were made by two Senior students at the Hydraulic Laboratory of the University of California in May, 1926. The results are in hand in the form of "A Thesis Prepared in the College of Civil Engineering University of California, May, 1926," by Lawrence P. Sowles and M. Bernard McGowan, Jr., Candidates for the Degree of Bachelor of Science in Civil Engineering; Professor Etcheverry acted as adviser.

Two pipes were made to intersect in a standard T-section. The flow in the main and the branch was varied and the resulting losses were measured. More experiments are needed, however, before conclusive data can be presented.

The purpose of the experiments was to test the fundamental theory involved in the design of side-channel spillways.

#### SUB-COMMITTEE ON NOMENCLATURE

Owing to the great diversity of meaning given terms used in irrigation hydraulics and the variety and often cumbersome symbols used by writers on the subjects involved, a Sub-Committee on Nomenclature was appointed, consisting of Messrs. B. A. Etcheverry, J. C. Stevens, and F. C. Scobey.

The work of this Sub-Committee shall be to outline and define suitable terms and symbols for the more important functions used in irrigation hydraulics, with a view to their adoption as a standard avenue of expression.

Respectfully submitted,

D. C. HENNY, *Chairman*,  
J. C. STEVENS, *Secretary*,  
B. A. ETCHEVERRY,  
J. L. SAVAGE,  
FRED C. SCOBEY,  
FRANKLIN THOMAS,  
R. L. PARSHALL,  
JULIAN HINDS,  
A. L. SONDEREGGER,  
R. A. MONROE.

December 11, 1926.

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### APPENDIX A

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#### EXPERIMENTS ON THE FLOW THROUGH FLUME TRANSITIONS

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SYNOPSIS OF EXPERIMENTAL RESULTS OBTAINED BY PHILIP F. THAYER AND  
J. PERRY YATES, CANDIDATES FOR THE DEGREE OF BACHELOR OF SCIENCE  
IN CIVIL ENGINEERING, UNIVERSITY OF CALIFORNIA, MAY, 1926

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Experiments were made to determine the energy loss in flume transitions with varying degrees of expansion. Water was pumped from the Sacramento River near Meridian, Sutter County, Calif. The flow was measured with a Cipolletti weir and hook-gauge. The pump discharged into a surge chamber, then over the weir, and finally into a flume supported so that its grade could



be altered. It was connected at the outlet end with a wooden trapezoidal section in which transitions of various shapes were used. Datum boards were set at points where the water surface elevations were desired, and measuring rods with steel points were used to determine surface and bed elevations directly. A maximum flow of 8 sec.-ft. was available.

In order to determine the true efficiency of a transition it is obvious that there must be no fall in the water surface over what would be required to provide for changes in velocity heads and to supply the energy losses that occur. For example, in any transition the water must be held as high as possible in it without increasing the depth in the channel approaching it. Otherwise the transition will also constitute a drop although the actual unnecessary fall may be very slight.

*Notation.*—In Tables 1 and 2 the symbols used have the following significance:

$\theta$  = the angle of expansion of each transition wall.

$l$  = the length of conduit, including the transition considered in calculating the efficiencies of the transition.

$Q$  = flow, in cubic feet per second.

$d_1$  = depth of water at the beginning of the length,  $l$ .

$d_2$  = depth of water at the end of the length,  $l$ .

$h_1$  = velocity head at the beginning of the length,  $l$ .

$h_2$  = velocity head at the end of the length,  $l$ .

$\Delta h$  = difference in velocity heads in the length,  $l$ .

$\Delta e$  = difference in elevation of water surfaces in the length,  $l$ .

$E$  = efficiency of the transition. It is the ratio,  $\frac{\Delta e}{\Delta h}$ , for exit transi-

tions, and  $\frac{\Delta h}{\Delta e}$ , for entrance transitions. Friction losses are included in the term,  $\Delta e$ .  $E$  is, therefore, the proportion of the energy of the flowing water at the end of one type of conduit converted into useful energy at the beginning of the next type.

*Exit Transitions.*—A series of runs were first made in conversions between a 2-ft. rectangular flume and a trapezoidal section the bottom width of which was 3 ft. and the side slopes, 1.5 : 1. Vertical walled transitions, 16 ft. long, with varying rates of expansion, were used. There was an abrupt drop in the channel bed of 4 in. at the outlet of the flume. The length considered was from the mouth of the flume to quiet water in the trapezoidal section below.

Considerable time was spent in experimenting with vertical walls having re-entrant curves or contractions at the beginning of the transition, with bottom humps of various shapes and with dividing vanes, in an attempt to reduce the losses. No tangible results were secured. These experiments, are, therefore, omitted.

Where velocities were above the critical in the flume an hydraulic jump occurred in the transition. The maximum efficiency obviously occurred when the water was checked up until the jump occurred at the mouth of the flume.

The losses included are the result of channel friction in the length considered and of eddies at the entrance and throughout the expanding section. The results for velocities exceeding the critical are given in Table 1.

The runs given are those which showed the highest efficiencies in each series.

The 11° enlargement showed slightly higher efficiencies than the 7° and 15° enlargements. It is remarkable that the 90° enlargement, or square head wall, showed very high efficiencies. Other runs (not given) on 90° enlargements showed efficiencies between 63 and 68 per cent.

A series of similar runs were made substituting a semi-circular steel flume for the rectangular wooden flume. In general, the efficiencies were somewhat lower with the semi-circular flume. This was due no doubt to greater eddying at the junction of the flume and transition since the change from semi-circular to rectangular was abrupt.

TABLE 1.—EFFICIENCIES OF STRAIGHT WALLED OUTLET TRANSITIONS FROM A RECTANGULAR FLUME, 2 FEET WIDE, TO A TRAPEZOIDAL SECTION WITH A BOTTOM WIDTH OF 3 FEET, AND SIDE SLOPES OF 1.5:1. FLUME VELOCITIES EXCEEDING THE CRITICAL.

Run.	$\theta$ .	$l$ .	$Q$ .	$d_1$ .	$d_2$ .	$h_1$ .	$h_2$ .	$\Delta h$ .	$\Delta e$ .	$E$ .
22	7°	21	6.25	0.47	1.51	0.688	0.009	0.679	0.59	87%
38	11°	21	6.06	0.46	1.49	0.681	0.009	0.672	0.59	88
50	15°	21	6.47	0.48	1.52	0.708	0.010	0.698	0.59	84
128	90°	22	6.06	0.46	1.44	0.677	0.010	0.667	0.53	79

*Entrance Transitions.*—The only entrance shape on which experiments were made was one with vertical cylindrical walls the radius of curvature of which was equal to the width of the flume. The flume was rectangular. The approach channel was trapezoidal with a bottom width of 3 ft. and side slopes of 1.5:1. The flume bed was 0.56 ft. above the bed of the approach channel. The rise was abrupt in Runs 19, 20, and 109, but gradual in Run 123. The results are given in Table 2.

TABLE 2.—EFFICIENCIES OF A CYLINDRICAL WALLED ENTRANCE TRANSITION FROM A TRAPEZOIDAL SECTION, WITH BOTTOM WIDTH OF 3 FEET, AND SIDE SLOPES OF 1.5:1, TO A 2-FOOT RECTANGULAR FLUME.

Run.	$l$ .	$Q$ .	$h_1$ .	$h_2$ .	$\Delta h$ .	$\Delta e$ .	$E$ .
19.....	3	6.38	0.009	0.563	0.554	0.590	94%
20.....	3	6.38	0.009	0.584	0.575	0.600	96
109.....	6	5.71	0.014	0.549	0.535	0.550	97
123.....	3	6.01	0.013	0.581	0.568	0.580	93

The losses are largely due to friction and eddying at the abrupt rise in the bed at the entrance. Although the abrupt rise was eliminated in the last run there was undoubtedly some cavitation at this point.

The results of these experiments confirm the opinion that greater losses must be expected in enlargements than in contractions. Contractions where velocities are increased may be made comparatively short, whereas enlargements for reducing velocities must be more elaborate, requiring more careful design if a substantial portion of the energy is to be recovered.

## APPENDIX B

### SILTING OF RESERVOIRS

STUDIES BY ENGINEERS, WITH BIBLIOGRAPHY.

BY KIRK BRYAN, ESQ.\*

One of the most difficult problems in planning great engineering works, particularly works for irrigation, is the estimation of the probable life of

\* Geologist, U. S. Geological Survey, Washington, D. C.

reservoirs located on rivers that carry large quantities of fine sediment. In the United States, the Rio Grande, Gila, and Colorado Rivers have provoked the largest amount of study, but there are numerous smaller streams that carry relatively large quantities of material which forms a menace to prospective reservoirs. The studies necessary for the prediction of the life of reservoirs are obviously very practical inquiries into the laws of sedimentation. The results of such studies, if properly made, are of great interest to geologists, both because of the principles of sedimentation involved, and because quantitative results are attained by which the rate of sedimentation and of the prerequisite reduction of the land surface may be deduced.

In its simplest form, such a study involves the flow of the stream at the reservoir site and the quantity of "silt" in the water. Generally, it is impossible to determine the rolling load which must ordinarily be merely estimated, and only the suspended matter is measured. For attempts to measure or estimate the rolling load, see Davis (1899) and Hughes (1914). The details of the method of collecting samples of water containing the suspended load have varied according to facilities and there has been much discussion as to how many samples and how large samples must be taken to give a fair representation of the load for the known discharge. The greatest difficulty comes, however, in converting the percentage of silt in the water, whether taken by volume or by weight, into volume of sediment deposited in the reservoir. This is a general problem in sedimentation. What is the weight per unit volume of material dumped into the reservoir under the variable conditions of its operation? Part is deposited at the upper end, part in the middle, and part at the lower or deeper end. Some is of the nature of a true delta, some is similar to lake mud, some is air-dried when the reservoir is partly empty, and some may never be dry. How much will it be compacted by overlying material later deposited? Engineers by various tests have assumed that the sediment, when deposited and compacted, would weigh from 50 to 120 lb. per cu. ft. Follett made one field determination of silt deposited by the Rio Grande before the Elephant Butte Reservoir was built and obtained 53 lb. per cu. ft., but, later, Goghland and Lieb, with seventeen samples taken from the floor of the reservoir after it was built, obtained an average weight per foot of 92.3 lb. Hughes determined weights for fifteen samples of Gila River deposits, which averaged 74.2 lb. per cu. ft. One specimen, which had a dry weight of 78.3 lb., was subjected to a pressure of 100 lb. per sq. in. for three days, and then to 150 lb. per sq. in. for two days more. The weight at the end of this period was 95 lb. per cu. ft., and the voids had been decreased from 54 to 44 per cent.

The upper layers of sediment in a reservoir should, on theory, have less weight and greater percentage of voids, than the lower layers which are under load. Hughes' experiment seems to confirm this point, but the amount of compression in silt actually deposited in a reservoir has never been determined by direct observations.

It is obvious, also, that the observations on silt content of rivers have not distinguished clearly between the parts of the sediment that are discrete particles and those parts which are colloidal. The nature of the investigations has required rough estimates rather than exact determinations and many refinements of method are feasible.

Only a few reservoirs have been built for a sufficiently long time so that measurements of the volume lost by silting can be made, but such studies have been made by Taylor (1900) and Robinson (1919). Measurements of this kind afford a check on the predictions based on silt determinations made before the reservoir was built. Further studies of silt accumulation are now in progress, notably in the Bureau of Reclamation and in the United States Geological Survey, but have not yet reached the stage of publication.

It has seemed worth while to prepare the Bibliography attached. Part of the references are given in a bibliography\* prepared by the Committee, already referred to, part were furnished by the Engineering Division of the Bureau of Reclamation, and part have resulted from a general search of the literature. Doubtless papers that should be included have been overlooked, but it is believed that all the more important papers on American rivers have been listed. A few general references are included. References to similar studies in other parts of the world will be found in Etcheverry's and Geikie's textbooks.

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UNPUBLISHED MATERIAL, FILES OF U. S. BUREAU OF RECLAMATION,  
WASHINGTON, D. C.

**Colorado River:** November 5, 1915, No. 4841. (30 blueprint tables.) March 20, 1917, No. 62741. (30 or more blueprint tables.) Report on Problems of the Colorado River Basin. Vol. 4, p. 72, February, 1924. (Summary in LaRue, 1925.)

**Elephant Butte Dam:** Report of Silt Survey, May 29, 1917, No. 49977, Rio Grande. Vol. 664. Letter by A. P. D., Dated March 14, 1923, to Governor Hunt of Arizona, on Silt Disposal. No. 5462.

**Lake McMillan:** Letter of August 11, 1915, Registered No. 37305. (Six pages and blue prints.) Reference to Silt Survey, Vol. No. 651.

**Roosevelt Reservoir:** Letter of August 16, 1917 (File No. 26), Serial Nos. 16885 and 71846. Report on Silt Survey in Project History for 1916, pp. 32-36.

UNPUBLISHED MATERIAL, FILES OF U. S. GEOLOGICAL SURVEY,  
WASHINGTON, D. C.\*

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**Stabler, Herman.** Silt in proposed reservoirs of the Ohio Basin. *Engineering News*, Vol. 60, pp. 649-651, December 10, 1908.

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\* The U. S. Geological Survey, Water Resources Branch, has been collecting and studying twenty-four samples per week from Colorado River at Topock and Grand Canyon Gauging Stations and a less number from other gauging stations on the river and its tributaries. Board of Water Engineers, State of Texas, Austin, Tex., has made silt studies on Texas streams, mostly on Brazos. These are as yet unpublished.

## Progress Report of the Special Committee to Codify Present Practice on the Bearing Value of Soils for Foundations, Etc.\*

TO THE MEMBERS OF

THE AMERICAN SOCIETY OF CIVIL ENGINEERS:

Your Special Committee appointed: (1) To Codify Present Practice on the Bearing Capacity of Soils for Foundations; and (2) to Report on the Physics of Soils in Relation to Engineering Structures, respectfully submits this report of progress.

During the past year (1926) your Committee has held two meetings and the minutes of these meetings have been forwarded to the Secretary of the Society. No expenses have been incurred during the year.

The task is divided into two parts. Under the first division of its work your Committee has been engaged during the past fourteen years on this complex subject, and has reported on various phases of it from time to time. These reports are thought to be of considerable importance; but as they have been printed in *Proceedings* and not in *Transactions*, they are largely lost and not available to the membership.

Your Committee found in the development of the program that general principles could not be elucidated, owing to the many exceptions. Your Committee believes that the only feasible way to proceed is to treat of simply specific cases, and that the "Manual of Practice" which was proposed† last year is a simple means of accomplishing that object. Therefore, it is recommended that in addition to the excerpts from the past progress reports of your Committee there is available a considerable amount of data collected by the Committee that should be included. Part of these reports and the comprehensive bibliography now being brought up to date by the Carnegie Library at Pittsburgh, Pa., might be represented and made available to the membership but paid editorial work and publication costs would be required. Your Committee is composed of very busy men who have little time to devote to that part of the work, and it does not have paid assistants to follow it up.

Finally, your Committee deeply recognizes the great importance of this division of the work, but it would like to be relieved and asks to be discharged. However, it unanimously recommends that a committee be continued on the second division of the work, that is, the "Physics of Soils in Relation to Engineering Structures".

Respectfully submitted,

ROBERT A. CUMMINGS, *Chairman*.

January 17, 1927.

The Committee:

ROBERT A. CUMMINGS, *Chairman*,

E. G. HAINES, *Secretary*,

W. J. DOUGLAS,

ALLEN HAZEN,

J. C. MEEM,

GEORGE PAASWELL.

\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., April, 1926, Society Affairs, p. 311.

## Progress Report of Joint Conference Committee on Specifications for Steel Railway Bridges\*

TO THE BOARD OF DIRECTION,

AMERICAN SOCIETY OF CIVIL ENGINEERS:

GENTLEMEN.—The Joint Conference Committee, composed of four members of the American Railway Engineering Association and four members of the Society, submits the following progress report for the information and discussion of the membership.

The Committee is pleased to report that substantial progress has been achieved toward harmonizing the two specifications. It will be noted that tentative agreements have been reached on a large number of items, and that special attention is being given certain points that required detailed study and consideration. When a tentative agreement has been reached on these, it is expected the specification as a whole will again be reviewed and a final report issued in the near future.

HENRY B. SEAMAN, *Chairman,*

Special Committee on Bridge Design and Construction.

December 16, 1926.

A joint committee was formed in 1925 by appointments from the American Railway Engineering Association and the American Society of Civil Engineers, to make a study of the specifications for steel railway bridges issued by each of these bodies, with a view to preparing for adoption a single set of specifications.

The American Railway Engineering Association specifications were adopted by the Association in 1920, and were published in Vol. 21 of its *Proceedings*. A number of revisions have been made. The third edition, which is the latest, was issued in August, 1925.

The American Society of Civil Engineers specifications were adopted by the Society in 1923, and were published in Vol. LXXXVI (1923) of the Society's *Transactions*. No revisions have been made.

Both sets of specifications were submitted in 1924 to the American Engineering Standards Committee for adoption as a Standard, but neither was adopted. After the discussion of the specifications before a committee of the American Engineering Standards Committee, it was suggested that the sponsor bodies appoint a Joint Committee to review the specifications for the purpose of eliminating the differences. This suggestion was favorably received and a Joint Committee was agreed upon, to consist of four members from the American Railway Engineering Association, and four from the American Society of Civil Engineers. The appointment of the undersigned members followed.

The Committee met in Chicago, Ill., on January 30, 1926, to organize, decide on methods of procedure, and outline the program of work. At this

\* Presented to the Annual Meeting, January 19, 1927.

meeting the Committee agreed to extend invitations to Robert Farnham, M. Am. Soc. C. E., Engineer of Bridges and Buildings, Pennsylvania Railroad, O. E. Hovey, M. Am. Soc. C. E., Assistant Chief Engineer of the American Bridge Company, and Lee H. Miller, M. Am. Soc. C. E., Chief Engineer of the American Institute of Steel Construction, to attend the Committee's meetings and act in an advisory capacity. All accepted the invitations and have taken active part in the work of the Committee.

The Committee has held three two-day meetings since that of January 30. The method of procedure has been to compare the corresponding sections of the specifications and adopt one of the two, or a section differing from both, on which the Committee could agree. Sections on which there was considerable divergence of opinion were deferred for action at a later meeting. Sections of special importance, so deferred, were assigned to sub-committees. All sections adopted thus far have been accepted unanimously by the Committee.

The Committee has completed the general review of the specifications and now is making studies on the subjects deferred for special attention. These subjects are: Clearances; live load; impact; eye-bars, making; eye-bars, full-sized tests; alloy steels; and materials.

The Committee desires to call special attention to certain sections adopted, that constitute a distinct departure from established practice. Among these are the sections on "Unit Stresses" and "Provision for Overload", which are given in full as adopted by the Committee.

The Committee recognizes the inconsistency in the present practice of using a permissible unit stress lower than is known to be safe, in conjunction with a live load known to be lighter than the loads to which the bridge is likely to be subjected during its life. One result of this practice is that the members of the bridge are not uniformly capable of carrying increased live load. The ideal arrangement would be to design for the greatest ultimate load, compute all stresses—dynamic, secondary, and other—and allow a unit stress just under the elastic limit.

Uncertainty as to all these features makes it impracticable and unsafe to reach this ideal literally but the more closely it is approached the more economical and consistent will be the design. To that end the Committee has adopted a basic allowable unit stress in tension of 20 000 lb., with the provision that it be used with a live load approximately one-fourth larger than those heretofore ordinarily used in designing. This increased live load is expressed tentatively by E-80 or M-67.

#### Unit Stresses

	Pounds per square inch
Axial tension, net section.....	20 000
Axial compression, gross section.....	20 000
	$1 + \frac{l^2}{18\,000}$
but not to exceed.....	17 000

in which,

$l$  = length of member, in-inches.

$r$  = least radius of gyration of member, in inches.

	Pounds per square inch
Tension in extreme fibers of pins.....	30 000
Shear in plate-girder webs, gross section.....	12 500
Shear in power-driven* rivets and pins.....	15 000
Bearing on power-driven* rivets, pins, outstanding legs of stiffener angles, and other steel parts in contact.....	30 000
Bearing on turned bolts and hand-driven rivets.....	25 000
Bearing on expansion rollers, per linear inch.....	750 <i>d</i>

in which,

$d$  = the diameter of rollers, in inches.

#### Allowable Pressure on Masonry

Bearing on granite masonry.....	1 000
Bearing on sandstone and limestone masonry.....	500
Bearing on concrete masonry "2 500 lb. at 28 days".....	750

#### Provision for Overload

Web members shall be so proportioned that an increase of the live load by 30% will not produce unit stresses in the members more than 30% greater than those specified under "Unit Stresses".

The Committee discarded the 300-ft. maximum limit of span length fixed by the American Railway Engineering Association specifications, it being the intention to make these specifications applicable without restriction as to span lengths.

The work is by no means near completion. There remain several subjects fundamental in character, which must be given careful study before recommendations can be made. The specifications for "Materials" have not been taken up, and those for "Inspection", "Painting", and "Shipping" are still uncompleted. After agreement has been reached on the substance of the specifications, considerable time will be required for a thorough review of the sections to arrange them in consistent order.

In presenting this progress report, the Committee desires to emphasize the fact that the sections adopted are subject to further review, and rejection or revision. All sections are to be regarded as tentative in form until the Committee has made its final report.

This report is submitted at this time to the American Railway Engineering Association and the American Society of Civil Engineers, so that their membership will be fully informed as to the progress of the work.

Respectfully submitted,

From American Railway  
Engineering Association

{ O. F. DALSTROM, *Chairman*,  
O. E. SELBY,  
I. L. SIMMONS,  
F. E. TURNEAURE.

From American Society of  
Civil Engineers

{ C. R. HARDING,  
HENRY B. SEAMAN, *Vice-Chairman*,  
I. F. STERN,  
GEORGE F. SWAIN.

November 1, 1926.

\* Rivets driven and bucked by pneumatically or electrically driven hammers are considered power-driven.



### Progress Report of Special Committee on Arbitration\*

TO THE BOARD OF DIRECTION AND MEMBERS,  
AMERICAN SOCIETY OF CIVIL ENGINEERS:

GENTLEMEN.—The Special Committee on Arbitration requested,† at the Annual Meeting in January, 1926, that it be continued in order to arouse interest in arbitration in Local Sections located in States where modern types of arbitration laws might be before the Legislatures.

However, the Committee was inactive during 1926 because only a few State Legislatures met last year and at only one of these did an arbitration law receive attention.

This winter (1926-27), however, it is expected that arbitration laws will be presented before quite a number of State legislative bodies. It is, therefore, possible that Local Sections of the Society may be able to give valuable help in studying the measures offered and counseling the legislative bodies.

Such counseling would seem the more desirable because the joint meeting of the Structural and Construction Divisions of the Society at Philadelphia, Pa., October 8, 1926, adopted a resolution endorsing the "plans, purposes and activities of the American Arbitration Association" and recommending that all the States not now having such laws consider the enactment of an arbitration law based on those of New York and New Jersey and on the Federal Arbitration Law.

For these reasons your Committee suggests that it be continued for another year.

Respectfully submitted,

JOHN F. COLEMAN,  
ARTHUR H. MARKWART,  
S. M. SWAAB,  
LEONARD C. WASON,  
EDWARD J. MEHREN, *Chairman.*

January 19, 1927.

\* Presented to the Annual Meeting, January 19, 1927.

† *Proceedings*, Am. Soc. C. E., March, 1926, Society Affairs, p. 247.

## Report of Joint Committee on Stresses in Structural Steel

Under date of June 1, 1923, the American Institute of Steel Construction issued its Standard Specifications for Structural Steel for Buildings, in which the allowable fiber stresses were 15 000 lb. per sq. in. for columns and 18 000 lb. for beams. The Special Committee of the American Society of Civil Engineers on Stresses in Structural Steel, however, in its Majority Report, presented to the Annual Meeting on January 21, 1925, recommended allowable fiber stresses of 16 000 lb. and 20 000 lb., respectively.

In an effort to determine if it were practicable to reconcile these apparent differences of opinion, a Joint Committee consisting of five members of the American Institute of Steel Construction and five members of the Society's Special Committee on Stresses in Structural Steel was set up on January 18, 1926, as a Joint Committee on Stresses in Structural Steel, with instructions to harmonize, if possible, the unit stresses permissible in structural steel. Messrs. M. S. Ketchum, Clyde W. MacCornack, Lee H. Miller, George F. Swain, and Paul Willis represented the American Institute of Steel Construction; and Messrs. H. G. Balcom, Clement E. Chase, F. O. Dufour, J. H. Edwards, and L. J. Towne represented the American Society of Civil Engineers, under the Chairmanship of George F. Swain, Past-President, Am. Soc. C. E.

On January 18, 1927, the report of this Joint Committee was presented to the Board of Direction and the conclusion reported was ordered printed in *Proceedings* for the information of the membership, as follows:

### ALLOWABLE STRESSES

All parts of the structure shall be so proportioned that the sum of the maximum static stresses, in pounds per square inch, shall not exceed the following:

- |   |        |
|---|--------|
| (a) Tension: Rolled steel, on net section.....  | 18 000 |
| (b) Compression: Rolled steel, on short lengths or where lateral deflection is prevented..... | 18 000 |

On gross section of columns.....	18 000
	$1 + \frac{l^2}{18\,000\,r^2}$
with a maximum of.....	15 000

in which,  $l$  is the unsupported length of the column, and  $r$  is the corresponding least radius of gyration of the section, both in inches.

For main compression members, the ratio,  $\frac{l}{r}$ ,

shall not exceed 120, and for bracing and other secondary members, 200.

- (c) Bending: On extreme fibers of rolled shapes, and built-up sections, net section, if lateral deflection is prevented .....

18 000

When the unsupported length,  $l$ , exceeds 15 times  $b$ , the width of the compression flange, the

stress, in pounds per square inch, in the latter

$$\text{shall not exceed} \dots\dots\dots \frac{20\,000}{1 + \frac{l^2}{2\,000\,b^2}}$$

The laterally unsupported length of beams and girders shall not exceed 40 times  $b$ , the width of the compression flange.

On extreme fibers of pins, when the forces are assumed as acting at the center of gravity of the pieces

(d) Shearing:

On pins	27 000
On power-driven rivets	13 500
On turned bolts in reamed holes with a clearance of not more than $\frac{1}{50}$ in.	13 500
On hand-driven rivets	10 000
On unfinished bolts	10 000

On the gross area of the webs of beams and girders, where  $h$ , the height between flanges, in inches, is not more than 60 times  $t$ , the thickness of the web, in inches.

On the gross area of the webs of beams and girders, if the web is not stiffened, where  $h$ , the height between flanges, in inches, is more than 60 times  $t$ , the thickness of the web, the maximum

$$\text{shear per square inch, } \frac{S}{A}, \text{ shall not exceed} \dots\dots\dots \frac{18\,000}{1 + \frac{h^2}{7\,200\,t^2}}$$

in which,  $S$  is the total shear, and  $A$  is gross area of web, in square inches.

(e) Bearing:

	Double shear.	Single shear.
On pins	30 000	24 000
On power-driven rivets	30 000	24 000
On turned bolts in reamed holes	30 000	24 000
On hand-driven rivets	20 000	16 000
On unfinished bolts	20 000	16 000

On expansion rollers per linear inch 600 times the diameter of the roller, in inches.

(f) Combined Stresses: For combined stresses due to wind and other loads, the permissible working stress may be increased 33½%, provided the section thus found is not less than that required by the dead and live loads alone.

(g) Members Carrying Wind Only: For members carrying wind stresses only, the permissible working stresses may be increased 33½ per cent.

## Engineering Societies Library

The services of the Engineering Societies Library are available to all members who wish searches, copies, translations, etc., or advice on technical literature. A collection of modern books is also available for loan to members in North America, at moderate rentals. Correspondence should be addressed to the Director, Engineering Societies Library, 29 West 39th Street, New York, N. Y., who will gladly give information concerning the charges for the various kinds of work. A more comprehensive statement in regard to this matter will be found on pages 110 and 111 of the Year Book for 1926.

### Book Notices\*

(January 3 to January 31, 1927)

**Erdstatische Berechnungen mit Reibung und Kohäsion.** By W. Feltenius. Berlin, Wilhelm Ernst & Sohn, 1927. 40 pp., diagrams, 10 x 7 in., paper. 4,20 r. m.

Ordinary problems of earth pressures consider only the frictional resistance of the earth and assume that the sliding surfaces are plane. This book presents the results of an investigation of this problem and gives a method for the systematic calculation of cases based on the presence of curved surfaces and also taking account of the cohesion, or rather adhesion of the soil.

**Geschiebebewegung in Flüssen und an Stauwerken.** By Armin Schoklitsch. Wien, Julius Springer, 1926. 108 pp., illus., diagrams, tab., 10 x 6 in., paper. 8,70 r. m.

This book presents the results of extensive experiments and observations upon silting in streams and storage reservoirs carried out in the hydraulic laboratory of the Graz Technical High School and compared with measurements and observation on water power plants near-by.

**Die Gewöhnlichen und Partiellen Differenzengleichungen der Baustatik.** By Fr. Bleich and E. Melan. Berlin u. Wien, Julius Springer, 1927. 350 pp., 9 x 6 in., boards. 28,50 r. m.

This book aims to fill the needs of structural engineers requiring differential equations as a means for the solution of engineering problems. The major part discusses the theory of ordinary linear differential equations and shows, by examples, how they are applicable for the solution of problems in statics.

**Der Grundbau: Vol. 1, Baugrund, Baustoffe, Pfähle und Spundwände, Baugrube.** By L. Brennecke. Fourth Edition Revised by Erich Lohmeyer. Berlin, Wilhelm Ernst & Sohn, 1927. 261 pp., illus., diagrams, 10 x 7 in., paper. 19,20 mk.

The revision of this well known work on foundations will appear in two volumes. This first volume treats of the fundamental principles, the chief structural materials used, of piles and sheet-piling, and of excavating and draining.

**Highway Administration and Finance.** By Thomas R. Agg, M. Am. Soc. C. E., and John E. Brindley. N. Y., McGraw-Hill Book Co., 1927. 382 pp., diagrams, tab., 9 x 6 in., cloth. \$4.00.

This textbook gives an account of the establishment and development of highway administration in America and discusses the financing of highway projects, the functions of highway departments, and the organization of the staff as applied to both States and municipalities.

\*The statements made in these notices are taken from the books themselves and this Society is not responsible for them. Unless otherwise specified, the books in this list have been donated by publishers.

**Hydro-Electric Handbook.** By William P. Creager and Joel D. Justin. Members, Am. Soc. C. E. N. Y., John Wiley & Co., 1927. 897 pp., illus., diagrams, maps, tab., 9 x 6 in., fabrikoid. \$8.00.

In the usual "handbook" form, this compendium of practice and theory covers all phases of hydro-electric work, such as the factors which determine the power available in a stream, the general design of the hydraulic plant, the design of dams, canals, flumes and pipes, the substructure and superstructure of the power-house, the turbines, the electrical design and equipment, and transmission lines.

**Moderne Grundbautechnik:** Vol. 1. By I. Zeissl. Berlin, Wilhelm Ernst & Sohn, 1927. 64 pp., illus., 8 x 6 in., paper. 2,70 r. m.

This brochure describes the Stern method of designing foundations and the Stern machine for testing the bearing power of soils.

**Pompe Centrifughe.** By Mario Medici. Milano, Ulrico Hoepli, 1927. 585 pp., illus., diagrams, 6 x 4 in., boards. 35.—lire.

This is a concise manual discussing the theory of the centrifugal pump, its design, and the construction of the various types and of regulating devices and other accessories.

**Water Power Engineering.** By H. K. Barrows, M. Am. Soc. C. E. N. Y., McGraw-Hill Book Co., 1927. 734 pp., illus., diagrams, tab., 9 x 6 in., cloth. \$6.00

This book discusses the applications of hydrology, hydraulics, and mechanics involved in the design of water-power plants and the electric transmission of power, including stream-flow data, turbines, plant arrangement, dams, canals, power-house equipment, regulation, transmission, costs, reports, etc.

**Water-Works Handbook.** By Alfred D. Flinn, Robert S. Weston, and Clinton L. Bogert, Members, Am. Soc. C. E. Third Edition. N. Y., McGraw-Hill Book Co., 1927. 871 pp., illus., diagrams, tab., 9 x 6 in., cloth. \$7.00.

The third edition of this standard work of reference has been carefully and thoroughly revised and in part rewritten, in an effort to make the book serviceable also to engineers and contractors interested in irrigation, power, railroads, and highways.

## Additions to the Reading Room

**Guide to Swiss Hydraulic Developments.** By Swiss Association for the Utilization of Hydraulic Power. English Edition. Zurich, 1926. 542 pp., illus., maps, 9½ x 6 in., cloth. \$5.00.

The object of this book of reference to hydraulic developments in Switzerland, is to make information on this subject immediately available to all those interested and to furnish a comprehensive survey of the work accomplished from a legal, economic, and technical standpoint. Among other important data, the text includes descriptions of all Swiss hydraulic power stations (arranged alphabetically and profusely illustrated) of 1000-h. p. or more, together with building costs, power distribution, legal data, etc.

**Successful Asphalt Paving.** By P. J. M. Larrañaga. Lond., Richard Clay & Sons, Ltd., n.d.

As stated in its sub-title this book contains a description of up-to-date methods, recipes, and theories, with examples and practical hints, for road authorities, contractors, and advanced students.

Abbrevia

Am. C.  
A. I. E.  
A. R. E.A. S. T.  
Am. Soc.  
Am. Soc.Am. W.  
Am. W.  
Ann. P.  
Ann. T.  
Assoc. I.Bost. So.  
Can. Eng.  
Cornell C.  
Duck &  
Eng. &  
Eng. &  
Eng. Ins.  
Eng. N.  
Engrs. S.  
Engrs. . .  
Engrs. J.Gas und  
Gen. Civ.  
Gesund.  
Inst. C.  
Inst. Mu.  
Int. Ry.  
Land. A.  
Mech. En.Mil. Eng.  
Min. &Mun. &  
N. E. W.  
N. Y. R.  
Oest. In.Power .  
Rev. Gen.  
Ry. Age.  
Ry. Eng.  
Ry. Rev.  
Schw. B.  
Sci. Am.  
Soc. Ing.Tech. G.  
Ver. der.  
West. R.  
West. S.  
Zeit. Ba.  
Z. d. Ba.



## Current Civil Engineering Literature

### Key to Abbreviated References to Publications Indexed\*

Abbreviated References.	Publication.	Place.
Am. C. Inst.....	American Concrete Institute, Proceedings (Y.)	Detroit
A. I. E. E.....	American Institute of Electrical Engineers Journal (M.)	New York
A. R. E. A.....	American Railway Engineering Association, Proceedings (Y.)	Chicago
A. S. T. M.....	American Society for Testing Materials, Proceedings (Y.)	Philadelphia
Am. Soc. C. E.....	American Society of Civil Engineers, Proceedings (M.)	New York
Am. Soc. Mun. Impvts..	American Society for Municipal Improvements, Proceedings (Y.)	New York
Am. W. W. Assoc.....	American Water Works Association, Journal (M.)	Baltimore
Am. Wood Pres. Assoc..	American Wood Preservers Association, Proceedings (Y.)	Chicago
Ann. P. et C.....	Annales des Ponts et Chaussées (Bi-M.)	Paris
Ann. T. P. Belg.....	Annales des Travaux Publics de Belgique (Bi-M.)	Brussels
Assoc. Ing. Gand.....	Annales de l'Association des Ingénieurs sortis des Ecoles Spéciales de Gand (Q.)	Ghent
Bost. Soc. C. E.....	Boston Society of Civil Engineers, Journal (M.)	Boston
Can. Engr.....	Canadian Engineer (W.)	Toronto
Cornell C. E.....	Cornell Civil Engineer (M.)	Ithaca
Dock & Harbour.....	Dock and Harbour Authority (M.)	London
Eng.....	Engineering (W.)	London
Eng. & Contr.....	Engineering and Contracting (W.)	Chicago
Eng. Inst. Can.....	Engineering Institute of Canada, Journal (M.)	Montreal
Eng. N. R.....	Engineering News-Record (W.)	New York
Engrs. Soc. W. Pa.....	Engineers' Society of Western Pennsylvania, Journal (M.)	Pittsburgh
Engr.....	Engineer (W.)	London
Engrs. & Eng.....	Engineers and Engineering, Engineers' Club of Philadelphia (M.)	Philadelphia
Gas und Wasser.....	Gas und Wasserfach (W.)	München
Gen. Civ.....	Le Génie Civil (W.)	Paris
Gesund. Ing.....	Gesundheits Ingenieur (W.)	Munich
Inst. C. E.....	Institution of Civil Engineers Minutes of Proceedings (Q.)	London
Inst. Mun. & Co. Engrs..	Institution of Municipal and County Engineers, Journal (W.)	London
Int. Ry. Cong. Assoc...	International Railway Congress Association, Bulletin (M.)	Brussels
Land. Arch.....	Landscape Architecture (M.)	Harrisburg
Mech. Eng.....	Mechanical Engineering (M.) Journal of the American Society of Mechanical Engineers	New York
Mil. Engr.....	Military Engineer (Bi-M.)	Washington
Mln. & Metal.....	Mining and Metallurgy (M.) American Institute of Mining Engineers	New York
Mun. & Co. Eng.....	Municipal and County Engineering (M.)	Indianapolis
N. E. W. W. Assoc.....	New England Water Works Association, Journal (Q.)	Boston
N. Y. R. R. Club.....	New York Railroad Club, Proceedings (M.)	Brooklyn
Oest. Ing. Arch. Ver...	Oesterreichischer Ingenieur und Architekten Verein, Zeitschrift (F.)	Vienna
Power.....	Power (W.)	New York
Rev. Gen.....	Revue Générale des Chemins de Fer (M.)	Paris
Ry. Age.....	Railway Age (W.)	New York
Ry. Eng. & Main.....	Railway Engineering and Maintenance (M.)	Chicago
Ry. Rev.....	Railway Review (W.)	Chicago
Schw. Bauz.....	Schweizerische Bauzeitung (W.)	Zurich
Sci. Am.....	Scientific American (M.)	New York
Soc. Ing. Civ. Fr.....	Société des Ingénieurs Civils de France, Mémoires et Comptes Rendus (Q.)	Paris
Tech. Gemein.....	Technisches Gemeindeblatt (F.)	Berlin
Ver. deu. Ing.....	Verein deutscher Ingenieure, Zeitschrift (W.)	Berlin
West. Ry. Club.....	Western Railway Club, Proceedings (M.)	Chicago
West. Soc. Engrs.....	Western Society of Engineers, Journal (M.)	Chicago
Zeit. Bau.....	Zeitschrift für Bauwesen (Q.)	Berlin
Z. d. Bauer.....	Zentralblatt der Bauverwaltung (W.)	Berlin

\* Y = Yearly; Q = Quarterly; M = Monthly; F = Fortnightly; W = Weekly.

## A. Applied Sciences

### a. Processes of Calculation

#### 2. Graphical and Nomographical Processes

Straight Line Plotting of Skew Frequency Data.\* Discussion: W. A. Shewhart, W. H. R. Nimmo, and John Tucker, Jr. Am. Soc. C. E. Jan., '27.

#### 3. Stresses and Strains

Sinusoid and Parabola in Structural Design.\* Robins Fleming. Can. Engr. Dec. 21, '26.

## B. Applied Mechanics

### a. Mechanics of Solids (Strength of Materials)

#### 2. Elastic Solids

The Stresses in a Free Prismatic Rod Under a Single Force Normal to Its Axis.\* Joseph N. Le Conte, Esq. Am. Soc. C. E. Jan., '26.

#### 6. Heterogeneous Solids (Reinforced Materials)

Distribution of Reinforcing Steel in Concrete Beams and Slabs.\* Discussion: Charles S. Whitney and David A. Molitor. Am. Soc. C. E. Jan., '27.

### b. Hydraulics

#### 3. Industrial Hydraulics

Rack Structure and Penstock Intake of the Isle Maligne Hydro-Electric Power Station.\* W. S. Lee. Eng. Inst. Can. Jan., '27.

The Water Power Developments of the Alouette-Stave-Ruskin Group of the British Columbia Electric Railway Company, Limited.\* E. E. Carpenter. Eng. Inst. Can. Jan., '27.

Das Achsenseekraftwerk.\* (The Achensee Power Plant.) Erich Heller. Oest. Ing. Arch. Ver. Dec. 24, '26.

Kraftwerk Tremorgio der Officine Elettriche Ticinesi Soc. An., Bodio.\* (Tremorgio Power Plant of the Officine Elettriche Ticinesi Soc. An., Bodio.) M. Trazcinski. Schw. Bauz. Serial beginning Jan. 1, '27.

## C. Materials of Construction and General Processes

### a. Lime, Cement, Mortar, Concrete, Brick, Bitumin, Timber, etc.

Unit Stresses in Structural Materials. A Symposium. Discussion: J. A. L. Waddell, R. A. Caughey, and E. G. Walker. Am. Soc. C. E. Jan., '27.

Water-Ratio Specificatin for Concrete.\* Discussion: Harry C. Boyden and L. A. Perry. Am. Soc. C. E. Jan., '27.

Producing Concrete of Uniform Quality. Discussion: Harry C. Boyden and William H. Adams. Am. Soc. C. E. Jan., '27.

Corrosion of Concrete. Discussion: E. E. R. Tratman and John R. Baylis. Am. Soc. C. E. Jan., '27.

Deterioration of Concrete in Sea Water, and Preventative Methods.\* George Nicholson. (Paper read before Pacific Coast Assoc. of Port Auth.) Dock & Harbour Jan., '27.

Design of Early Strength Concrete. Harold Allen. Eng. & Contr. (Roads & Streets.) Jan., '27.

Recent Improvements in Making Portland Cement.\* Frederick W. Kelley. Eng. N. R. Jan. 13, '27.

Material, Mischungsverhältnis und Betonfestigkeit.\* (Material, Mixture Ratio and Strength of Concrete.) C. Rothert. Z. d. Bauver. Dec. 15, '26.

### b. Metals

La Cémentation de Produits Métallurgiques et Sa Généralisation.\* (Cementation of Metallurgical Products and its General Statement.) Leon Guillet. Assoc. Ing. Gand. Pt. 3, '26.

Anwendung der Röntgenstrahlen für die Werkstoffuntersuchung.\* (Application of X-Rays to the investigation of Materials.) G. Sachs. Ver. deu. Ing. Dec. 4, '26.

### c. Preservation and Use of Materials, Painting, Waterproofing

Die Entwicklung der Anstrichstoffe. (The Development of Coating Materials.) Hans Wolf. Z. d. Bauver. Dec. 8, '26.

### e. Earthwork. Cubage. Excavating Machinery

A 148 000 Yd. Substructure Excavation. Frank W. Skinner. Mun. & Co. Eng. Dec., '26.

Abstracts of Institute Papers. Min. & Metal. Jan., '27.

#### 2. Of Concrete

Winter Construction. Sanford E. Thompson. Bost. Soc. C. E. Dec., '26.

Construction Methods and Plant at Martin Dam, Alabama.\* L. G. Warren. Eng. N. R. Dec. 30, '26.

#### 5. Of Reinforced Concrete

Cheminées, Tours à Section Annulaire et Colonnes Creuses en Béton Armé.\* (Stacks, Towers with Annular Cross Section and Hollow Columns of Reinforced Concrete.) E. Massotte. Gen. Civ. Jan. 1, '27.

#### x. Miscellaneous

Construction Cost Estimating. Clayton W. Mayers. Bost. Soc. C. E. Dec., '26.

### h. Foundations, Bridge Piers and Abutments

Reinforced Concrete Mat to Support a 40-Story Building.\* D. M. Oltarsh. Cornell C. E. Dec., '26.

## j. Piles and Pile-driving

Fondations sur Pleux de Béton Armé Comprimé Pneumatiquement sans Ébranlement de Sol.\* (Foundations on Reinforced Concrete Piles Compressed Pneumatically without Disturbing the Ground.) E. Froté. Gen. Civ. Dec. 25, '26.  
 Ueber "Ortspfähle", unter besonderer Berücksichtigung des Bohrpfahlsystems "Michaelis".\* (On Piles Cast in Position, with Special Consideration of the "Michaelis" Pile Boring System.) Ch. Chopard. Schw. Bauz. Dec. 4, '26.

## k. Tunnels and Tunneling-Shields

Great Northern Builds Longest Railway Tunnel in America.\* Ry. Age Dec. 25, '26.

## l. Construction Machinery and Tools, Drainage

Statistische Untersuchung eines Schachtförderthurmes.\* (Static Investigation of a Shaft Winding Tower.) J. M. Bernhard. Oest. Ing. Arch. Ver. Dec. 10, '26.  
 Eine neue Gusstrennmachine. (A New Casting-Trimming Machine.) U. Lohse. Ver. deu. Ing. Dec. 18, '26.

## D. Highways

## c. Construction

Concrete vs. Timber for Highway Bridge Floors. O. L. Grover. (From *Public Roads*.) Mun. & Co. Eng. Dec., '26.  
 Experience With Various Types of Paving in California. C. S. Pope. (Paper read before League of Calif. Municipalities.) Mun. & Co. Eng. Dec., '26.  
 City Type Pavement on Rural Highways. Henry Brevoort Smith. (Paper read before Asphalt Pav. Conference.) Mun. & Co. Eng. Dec., '26.  
 Cost of Subgrade Preparation, Mixing, Laying, Finishing Concrete Highway Paving. L. F. Collingnon. (Paper read before Ill. Assoc. of Highway and Mun. Contrs.) Mun. & Co. Eng. Dec., '26.  
 Bituminous Sands and Highway Construction.\* K. A. Clark. (Paper read before Can. Good Roads Assoc.) Can. Engr. Dec. 28, '26.  
 Bituminous Macadam (Mixed Type) Construction. R. M. Smith. (Paper read before Fifth Asphalt Pav. Conference.) Can. Engr. Dec. 28, '26.  
 North Carolina Bituminous Earth Roads. William B. Catchings. Am. Soc. C. E. Jan., '27.  
 Recent Developments in Concrete Pavements. H. Eltinge Breed. Am. Soc. C. E., Jan., '27.  
 Finishing and Curing of Concrete Roads.\* Discussion: Herbert J. Gilkey. Am. Soc. C. E. Jan., '27.  
 Correlation of Stability Test With Behavior of Pavement Under Traffic.\* Prevost Hubbard and F. C. Field. (Paper read before Asphalt Pav. Conference.) Eng. & Contr. (Roads and Streets.) Jan., '27.  
 Sight Distance As Safety Factor in Highway Design.\* Fred J. Grumm. (From *California Highways*.) Eng. & Contr. (Roads & Streets.) Jan., '27.  
 Time Losses in Concrete Road Construction.\* Andrew P. Anderson. (From *Public Roads*.) Eng. & Contr. Jan., '27.  
 Highway Reconstruction Problems. P. M. Tebbs. (Paper read before Am. Assoc. State Highway Officials.) Eng. & Contr. (Roads & Streets.) Jan., '27.  
 The Surface Treatment of Gravel, Sand-Clay and Earth Roads.\* John D. Waldrop. (Paper read before Am. Assoc. State Highway Officials.) Eng. & Contr. (Roads & Streets.) Jan., '27.  
 Construction of Gravel Roads in B. C.\* Patrick Philip. Can. Engr. Jan. 4, '27.  
 Highway Construction Field Control. C. E. Foster. (Paper read before Univ. of Michigan.) Can. Engr. Jan. 4, '27.  
 Hot Application Surface Treatment. N. S. Anderson. (Paper read before Asphalt Paving Conference.) Can. Engr. Jan. 4, '27.  
 Theory of Spacing Cross Joints in Concrete Roads. W. W. Zass. Eng. N. R. Jan. 6, '27.  
 Rock Asphalt Road Construction with New Devices.\* W. L. Moore. Eng. N. R. Jan. 6, '27.  
 The Cameron Pass Highway.\* A. B. Collins. Eng. N. R. Jan. 6, '27.  
 Highway Grade Separation Design. C. F. Melick. (Paper read before Univ. of Michigan.) Can. Engr. Jan. 11, '27.  
 Construction of Hot Mix Pavement. Francis P. Smith. (Paper read before Asphalt Pav. Conference.) Can. Engr. Jan. 11, '27.  
 The Building of Roads in Alaska.\* Lunsford E. Oliver. Mil. Engr. Jan.-Feb. '27.

## d. Maintenance

Maintenance Costs of Brick Roads in Cuyahoga County.\* Eng. N. R. Jan. 6, '27.

## h. Vehicles, Automobiles, Traffic

Solving the Traffic Problem at Minimum Expense. W. Graham Cole. (Paper read before Conference of Mayors and Other Mun. Officials, N. Y. State.) Mun. & Co. Eng. Dec., '26.  
 Planning State Highway Systems. J. G. McKay. (From *Public Roads*.) Mun. & Co. Eng. Dec., '26.  
 The Dublin Traffic Problem.\* P. J. Raftery. Inst. Mun. & Co. Engrs. Dec. 21, '26.  
 Some Considerations on the Flow of Traffic.\* Kenneth S. Dodd. Inst. Mun. & Co. Engrs. Jan. 4, '27.

## E. Bridges, Viaducts, and Arches

## b. Iron and Steel Bridges and Viaducts

Teeswater River Viaduct at Paisley, Ont.\* J. Webb. Can. Engr. Dec. 28, '26.  
 Cable Construction on the Bear Mountain Bridge.\* Eng. Dec. 31, '26.

Highway Bridge Moved Without Interrupting Traffic.\* Eng. N. R. Jan. 6, '27.

Construction of Buffalo-Fort Erie Bridge.\* Can. Engr. Jan. 11, '27.

Die Friesenbrücke über die Ems bei Weener.\* (The Friesen Bridge over the Ems at Weener.) Schenkelberg. Z. d. Bauver. Serial beginning Nov. 24, '26.

#### d. Concrete and Reinforced Concrete Bridges and Viaducts

The Hudson Boulevard Bridge at Jersey City.\* Robert L. H. Tate. Cornell C. E. Dec., '26.  
Defects in New Concrete Bridge and Proposed Repairs.\* Eng. N. R. Dec. 30, '26.

#### g. Swing, Bascule, Lift, Floating, Oscillating Bridges, Traveling Cranes

Die Betriebseinrichtungen für die Verladebrücken am Erz- und Eisenkal im Seehafen Emden.\* (Operating Arrangements for the Loading Bridges on the Ore and Iron Dock in the Seaport of Emden.) L. Schulze. Z. d. Bauver. Dec. 15, '26.

#### h. Computation, Tests, etc.

Nouveau Calcul de l'Arc à Tirant Rigide et Falsant, Partie au Tablier.\* (New Calculation of the Rigid Arch Truss Forming Part of the Floor.) Leon Legens. Schw. Bauz. Dec. 25, '26.

### F. Inland Waters and Waterways

#### a. Natural Waterways (General Articles)

Interstate Water Problems and Their Solution. Discussion: M. C. Hinderlider and R. L. Meeker. Am. Soc. C. E. Jan., '27.

#### b. Canals (General Articles)

The New York State Barge Canal and Its Operations. Discussion: Harry Taylor, E. P. Goodrich, F. Lavis, J. K. Finch, and E. E. King. Am. Soc. C. E. Jan., '27.

#### c. Regulation of Waterways—Volume of Discharge, Freshets, Floods, Soundings

Sea Flood Planned for Leningrad, Russia.\* V. E. Linkhnitsky. Eng. N. R. Jan. 6, '27.

#### g. Consolidation of Banks, Leakage, etc.

Dredging Projects to Improve the Panama Canal.\* R. Z. Kirkpatrick. Eng. N. R. Dec. 30, '26.

Le Mécanisme des Alluvions.\* (The Mechanism of Sedimentary Deposits.) C. J. Van Mierlo. Assoc. Ing. Gand. Pt. 3, '26.

### G. Maritime Works

#### b. Management and Protection of Coasts, Beaches, Dunes.

Le Mécanisme des Alluvions.\* (The Mechanism of Sedimentary Deposits.) C. J. Van Mierlo. Assoc. Ing. Gand. Pt. 3, '26.

#### c. Vessels and Maritime Navigation, Lighthouses, Buoys, Various Signals

Das Rhein-Eilgüterboot "Jupiter".\* (The Rhine Express Boat "Jupiter".) Schw. Bauz. Dec. 4, '26.

Le Renflouement des Navires de Guerre Allemands Coulés par Leurs Équipages à Scapa-Flow.\* (The Floating of the German War Ships Sunk by their Crews at Scapa Flow.) Dant. Gen. Civ. Dec. 25, '26.

#### d. Roads and Outer Harbors. Dikes and Jetties. Breakwaters

Construction of Concrete Breakwater.\* Can. Engr. Jan. 11, '27.

#### h. Boats and Barges

Middlesbrough Docks.\* J. L. Calvard. Dock & Harbour Jan., '27.

Deterioration of Concrete in Sea Water, and Preventative Methods.\* George Nicholson. (Paper read before Pacific Coast Assoc. of Port Auth.) Dock & Harbour Jan., '27.

#### i. Traction, Haulage, Towing, Mechanical Tractors

The Port of Wiborg.\* Hannes Sauramo. Dock & Harbour Jan., '27.

### H. Railroads. Street and Interurban Railways. Automobiles. Aeronautics

#### a. Railroads

##### 1. General Articles

Personen-Sellschwebbahnen, Bauart Bleichert-Zuegg, mit besonderer Berücksichtigung der Zugschienenbahn.\* (Passenger Suspended Cable Railways, Bleichert-Zuegg Type, with Special Consideration of the Zugschienen Railway.) A. Rubin. Ver. deu. Ing. Dec. 25, '26.

##### 4. Track

Is the Wooden Railroad Tie Doomed? Sci. Am. Jan., '27.

Pere Marquette Begins Test of Concrete Roadbed.\* Ry. Age Jan. 8, '27.

La Démolition du Tunnel des Batignolles, à Paris. Achèvement des Travaux. Construction de Pont Portant le Chemin de Fer Métropolitain.\* (Demolition of the Batignolles Tunnel in Paris. Completion of the Work. Construction of the Bridge Carrying the Metropolitan Railway.) Paul Calfas. Gen. Civ. Dec. 4, '26.



**5. Signals and Safety Apparatus**

Great Northern Concludes Extensive Signaling Program.\* Ry. Age Jan. 8, '27.

**6. Rolling Stock, Fuel**

Union Pacific Type Locomotive Performance.\* Ry. Age Dec. 25, '26.

Versuchsfahrten mit der neuen Schnellzuglokomotive der Spanischen Nordbahn.\* (Test Trips with the New Express Locomotive of the Spanish Northern Railway.) Ad. Wolff. Ver. deu. Ing. Dec. 25, '26.

Die Kräftwirkungen bei Plattformkippern und Scherenkippern.\* (The Actions of Forces in Platform Tipplers and Car Tipplers.) Paul Nickel. Ver. deu. Ing. Dec. 25, '26.

Die 2 C 1-Einheits-Schnellzuglokomotive der Deutschen Reichsbahn.\* (The 2-C-1 Unit Express Locomotives of the German Government Railway.) D. F. Fuchs and R. P. Wagner. Ver. deu. Ing. Dec. 25, '26.

Le Monte-Wagons Electrique des Messageries de la Gare de Paris-St. Lazare.\* (The Electric Car Elevator of the Freight Service of the Paris-St. Lazare Station.) M. Merlet. Rev. Gen. Dec., '26.

Chasse-Neige Rotatif Electrique de la Compagnie P.-L.-M.\* (Electric Rotary Snow Plow of the Compagnie P.-L.-M.) M. A. Bergeret. Rev. Gen. Dec., '26.

**7. Use of Electricity**

Das Freiluft-Unterwerk Seebach der S. B. B.\* (The Seebach Open Air Substation of the S. B. B.) Siegfried Schild. Schw. Bauz. Dec. 11, '26.

1-C-Rangierlokomotiven der Schweiz. Bundesbahnen. (1-C Shunting Locomotives of the Swiss Federal Railways.) Schw. Bauz. Jan. 1, '27.

L'Electrification Partielle du Réseau du Chemin de Fer de Paris à Orléans. Equipment de la Ligne de Paris à Vierzon.\* (Partial Electrification of the Paris to Orleans Railway System. Equipment on the Paris to Vierzon Line.) A. Bidault, des Chaumes. Gen. Civ. Dec. 25, '26.

**8. Technical and Commercial Use**

The Motor Bus As a Means of Highway Transportation.\* Carl W. Stocks. Eng. N. R. Jan. 13, '27.

**d. Street Railways, Elevated Railways, Subways****1. General Articles**

Der Ausbau der elektrischen Hoch- und Untergrundbahn und die Wiederaufnahme des durchgehenden Zugverkehrs zwischen dem Osten und dem Westen Berlins.\* (Extension of the Electric Elevated and Underground Railway and the Resumption of Through Train Traffic Between Eastern and Western Berlin.) Bousset. Z. d. Bauver. Dec. 15, '26.

**4. Track**

Electrical Equipment of Track on the Underground Railways of London.\* Arthur R. Cooper. (Paper read before Inst. E. E.) Eng. Serial beginning Jan. 14, '27.

**5. Miscellaneous**

Moving Stairways on the London Underground Railways.\* Eng. Jan. 14, '27.

**e. Automobiles****2. Internal Combustion Engines Automobiles**

Les Camions à Gazogène. Considérations Générales et Description des Principaux Modèles Français.\* (Gas Producer Lorries. General Considerations and Descriptions of the Principal French Types.) G. Delanghe. Gen. Civ. Jan. 1, '27.

**f. Aeronautics****1. General Articles**

Applications of Radio in Air Navigation.\* J. H. Dellinger. Mech. Eng. Jan., '27.

La Xe Exposition Internationale de l'Aéronautique (Paris, 3-19 décembre 1926).\* (The 10th International Aeronautical Exposition, Paris, December 3-19, 1926.) Andre Lesage. Gen. Civ. Serial beginning Dec. 11, '26.

Der Deutsche Seeflug-Wettbewerb 1926.\* (The 1926 German Seaplane Competition.) F. Gossiau. Ver. deu. Ing. Serial beginning Dec. 4, '26.

**4. Aerodromes and Landing Fields**

The Karachi Airship Shed.\* Engr. Dec. 24, '26.

**I. Municipal Water-Works. Agricultural Engineering. Irrigation****a. General Articles**

Lake Erie as a Public Water Supply. Howell Wright. Am. W. W. Assoc. Dec., '26.

Water Supply of Port Arthur, Ont.\* W. B. Redfern. Can. Engr. Dec. 28, '26.

**c. Dams and Reservoirs**

Lining and Covering of the High Service Reservoir at Quincy, Ill.\* Paul Hansen. Am. W. W. Assoc. Dec., '26.

Building Small Concrete-Lined Earth Reservoir.\* J. P. Bailey. Eng. N. R. Dec. 30, '26.

Water-Proof Masonry Dams.\* Discussion: H. deB Parsons, Alfred D. Flinn, J. B. W. Gardiner, T. Kennard Thomson, V. Bernard Slems, B. F. Jacobsen, and Eugene E. Halmos. Am. Soc. C. E. Jan., '27.

Novel Solution of Bridgeport Dam Spillway Problem.\* John A. Beemer. Eng. N. R. Jan. 20, '27.

**d. Analysis and Purification of Water**

Purification and Other Improvements of Great Lakes Water Supplies. George H. Fenkell. West. Soc. Engrs. Nov., '26.

Cleaning Philadelphia's Slow-Sand Filters Mechanically.\* George G. Schaut. Am. W. W. Assoc. Dec., '26.

Progress Report of Committee No. 18 on Sand Testing and Recording. Am. Soc. C. E. Dec., '26.



- Comparative Studies of Standard Methods and the Brilliant Green Bile Medium on Lake Michigan Water at Chicago.\* C. C. Ruchhoff. Am. W. W. Assoc. Dec. '26.  
 The Present Status of the Use of Iodides in the Minneapolis Water Supply. Arthur F. Mellen. Am. W. W. Assoc. Dec., '26.  
 Algae Treatment of Reservoirs, Recent Experience.\* Frank E. Hale. Am. W. W. Assoc. Dec., '26.  
 Coagulation with Sodium Aluminate. (Paper read before Southeastern Water & Light Assoc.) J. B. Barnitt and E. H. Haux. Can. Engr. Dec. 21, '26.  
 Coagulant Being Used to Reduce Turbidity in New York Water. W. W. Brush. Eng. N. R. Jan. 20, '27.  
 Korrosionen.\* (Corrosion.) H. Zurlinden. Tech. Gemein. Dec. 5, '26.

#### e. Distribution of Water

- Distribution Feeder Survey as a Basis for Improvement Studies.\* V. Bernard Siems and Edgar K. Wilson. Am. W. W. Assoc. Dec., '26.  
 The Sukkur Barrage Irrigation Project, 1920.\* F. W. Woods. Engr. Dec. 24, '26.  
 Irrigation Development Through Irrigation Districts. Discussion: E. Courtland Eaton and Frank Adams. Am. Soc. C. E. Jan., '27.  
 Vanne à Fermeture Automatique en Cas de Rupture de Conduite d'Eau.\* (Gates that Close Automatically in the Event of Rupture of Water Conduit.) H. Rousselet. Gen. Civ. Dec. 25, '26.

#### f. Drainage of Land

- Studies and Works of a Missouri Drainage District.\* Jacob A. Harman. Eng. N. R. Dec. 30, '26.

### J. Sewerage, Sewage and Refuse Disposal

#### a. Sewers and Drains

- Tests of Manhole Covers.\* T. J. Corwin, Jr. Am. Soc. C. E. Jan., '27.  
 Structural and Hydraulic Features of Outfall Sewer.\* W. H. Pinkham. Eng. N. R. Jan. 20, '27.

#### b. Sewage Disposal, Purification

- Sewage Disposal Practice in England.\* F. Johnstone Taylor. Can. Engr. Dec. 21, '26.  
 Hartford—Sewage Disposal Works and Housing.\* S. M. Senior. Inst. Mun. & Co. Eng. Dec. 21, '26.  
 The Design, Construction, and Operation of a Small Sewage Disposal Plant. Discussion: Webster L. Benham. Am. Soc. C. E. Jan., '27.  
 Die Sanierungspläne der Stadt Mainz zur Zeit Napoleons I.\* (Plans for the Sanitation of the City of Mainz at the Time of Napoleon I.) Adolf Zeller. Zeit. Bau. Pt. 7, 1926.

### K. Heat Engines

#### a. Steam Engines, Boilers

- Die neuen deutschen Werkstoff- und Bauvorschriften für Landdampfkessel. (The new German Regulations for Material and Construction of Land Steam Boilers.) J. Bracht. Ver. deu. Ing. Dec. 11, '26.

### L. Electricity

#### b. Distribution and Transmission of Electricity

2. Long-Distance Transmission of Energy  
 Electrical Characteristics of the Quebec-Isle Maligne Transmission Line.\* Clarence V. Christie. Eng. Inst. Can. Jan., '27.  
 Hochspannungswegerecht. (High Tension Right of way.) C. von dem Busch. Tech. Gemein. Dec. 20, '26.  
 3. Distribution and Wiring of Electricity  
 60,000-Volt Underground Network of the Union d'Electricité.\* (Paper read before Inst. E. E.) Engr. Dec. 24, '26.  
 Evolution of the Automatic Network Relay.\* John S. Parsons. A. I. E. E. Jan., '27.  
 Recent Progress in Distribution Practice of the Brooklyn Edison Company, Inc.\* J. F. Fairman and R. C. Riefenburg. A. I. E. E. Jan., '27.

#### c. Electric Lighting

2. Uses  
 The Remote Control of Multiple Street Lighting.\* W. T. Dempsey. A. I. E. E. Jan., '27.  
 The Lighting of Railway Classification Yards.\* George T. Johnson. A. I. E. E. Jan., '27.

#### e. Electrochemistry and Electrometallurgy

- Alternating Current Electrolysis.\* J. W. Shipley and Chas. F. Goodeve. Eng. Inst. Can. Jan., '27.

#### f. Signals and Communication

- Machine-Switching Telephone Connections.\* William E. Moody. West. Soc. Engrs. Nov., '26.  
 Radio Broadcast Coverage of City Areas.\* Lloyd Espenschied. A. I. E. E. Jan., '27.

- La Télévision, par le Procédé Edouard Belin.\* (Television by the Edouard Belin Process.) Gen. Civ. Dec. 18, '26.  
Elektrische Hilfsmittel für die Fertigungskontrolle.\* (Electrical Aids in Production Control.) F. Ludwig. Ver. deu. Ing. Dec. 18, '26.

## M. Architecture

### a. Educational, Government and Scientific Buildings

- Neubau von Staatsbeamtenwohnungen in Trier.\* (New Construction of State Officials' Dwellings in Trier.) Lehmann. Z. d. Bauer. Dec. 29, '26.

### c. Residences, Hotels

- Das neue Heim, Ausstellung im Kunstgewerbemuseum Zürich.\* (The New Home, Exposition in the Museum of Useful Arts, Zürich.) Schw. Bau. Dec. 4, '26.  
Landhaus an der Schöllistrasse, Zürich.\* (Villa on Schöllistrasse, Zürich.) Schw. Bau. Dec. 25, '26.

### g. Other Buildings

- Das Gebäude des Golfklubs in Wannsee bei Berlin.\* (The Golf Club Building in Wannsee, near Berlin.) Z. d. Bauer. Dec. 15, '26.  
Das Tellspielhaus in Altdorf.\* (The Tell Theatre in Altdorf.) Schw. Bau. Jan. 1, '27.  
Der Umbau des vormals königlichen Schauspielhauses zu Berlin in den Jahren 1904 bis 1905.\* (Rebuilding the former Royal Theatre in Berlin, in the years 1904-1905.) Felix Genzmer. Zeit. Bau. Pt. 7, 1926.

### h. Roofs, Domes, Steel Framing

- Applying Principles of the Catenary to Roof Design.\* Martin Elizondo. Eng. N. R. Dec. 30, '26.  
Designing the Sharon Building for Arc-Welding.\* Gilbert D. Fish. Eng. N. R. Jan. 20, '27

## O. Administration. Legislation. Economics. Statistics

### g. Engineering Education

- Qualifying Engineers for High Executive Positions: An Informal Discussion. E. M. Herr, H. A. Guess, F. B. Jewett, and J. C. Parker. Am. Soc. C. E. Jan., '27.

## Q. Surveying and Geodesy

- Aerial Surveys Lend Confidence on Hastily Organized Job.\* Karl Riddle. Eng. N. R. Dec. 30, '26.  
Aerial Surveys for City Planning. Discussion: Theron M. Ripley. Am. Soc. C. E. Jan., '27.  
New Levels on Ordnance Survey Large Scale Maps. Inst. Mun. & Co. Engrs. Jan. 4, '27.  
Improved Map and Chart Pantograver.\* T. Peter Lampe. Mil. Engr. Jan.-Feb., '27.  
A Suggestion for Telemeter Traverses. Hugh C. Mitchell. Mil. Engr. Jan.-Feb., '27.  
Importance of Isostasy to Mapping.\* William Bowie. Mil. Engr. Jan.-Feb., '27.

## R. Landscape Engineering

- Landscape Gardening Indoors.\* Elmer Eugene Barker. Land. Arch. Jan., '27.  
The University of Nebraska Campus Plan.\* Wilbur C. Peterson. Land. Arch. Jan., '27.

## S. City Planning

- Relation of Zoning Ordinances to House Widths.\* Arthur Richards. Eng. N. R. Dec. 30, '26.  
The Cincinnati City Plan is Now Law. Discussion: Alfred Bettman, Edward M. Bassett, Arthur C. Comey, E. P. Goodrich, and Thomas T. Towles. Am. Soc. C. E. Jan., '27.  
Town Planning and Its Relation to the Professions Involved. Discussion: Edward M. Bassett, and J. E. Willoughby. Am. Soc. C. E. Jan., '27.  
Internationaler Städtebau- und Wohnungskongress und Internationale Städtebau-Ausstellung, Wien, 1926. (International City Building and Dwelling Congress and International City Building Exhibition, Vienna, 1926.) A. G. Stradal. Oest. Ing. Arch. Ver. Dec. 24, '26.

## Employment Service

The Engineering Societies Employment Service is under the joint management of the National Societies of Civil, Mining, Mechanical, and Electrical Engineers. A Chicago office is maintained in co-operation with the Western Society of Engineers, and a San Francisco office, in co-operation with the Engineers' Club of San Francisco and the California Section of the American Chemical Society. The Service is available only to the several memberships and is maintained by contributions from the Societies and their individual members who are directly benefited.

*Offices.*—Eastern Office, 33 West 39th Street, New York, N. Y., Walter V. Brown, Manager; Chicago Office, 53 West Jackson Boulevard, Room 1736, Chicago, Ill., A. Krauser, Manager; and San Francisco Office, 57 Post Street, Room 715, San Francisco, Calif., Newton D. Cook, Manager.

*Men Available.*—Under this heading, brief announcements will be published without charge. These announcements will not be repeated, except on request received after an interval of one month. Names and records will remain in the active files of the Service for a period of three months, and are renewable on request. Notices for *Proceedings* should be addressed to Employment Service, 33 West 39th Street, New York, N. Y., and should be received prior to the first of the month.

*Opportunities.*—A Bulletin of engineering positions available is published weekly and may be obtained by members of the Societies concerned at a subscription rate of \$3 per quarter, or \$10 per annum, payable in advance. Positions which are not filled promptly as a result of publication in the Bulletin, may be announced herein.

*Voluntary Contributions.*—Members obtaining positions through the medium of this Service are invited to co-operate with the Societies in the financing of the work by nominal contributions made within thirty days after placement, on the basis of \$10 for all positions paying a salary of \$2 000 or less per annum; \$10 plus 1% of all amounts in excess of \$2 000 per annum; temporary positions (of one month or less), 3% of total salary received. The income contributed by the members, together with the finances appropriated by the four Societies named, will be sufficient, it is hoped, not only to maintain but to increase and extend the Service.

*Replies to Announcements.*—Replies to announcements published herein, or in the Bulletin, should be addressed to the key number indicated in each case, with a two-cent stamp attached for re-forwarding, and forwarded to the Employment Service at the address given. Replies received by the Service after the positions to which they refer have been filled, will not be forwarded.

### POSITIONS AVAILABLE

RESEARCH GRADUATE, assistant in engineering experiment station, devoting half time to engineering, remainder to graduate study. Position affords excellent prep-

aration for teaching, research, and general engineering practice. Salary, \$600 per year and freedom from fees. Apply by letter. Location, Middle West. X-1797-C.

### MEN AVAILABLE

PROFESSOR OF CITY PLANNING AND MUNICIPAL ENGINEERING, M. Am. Soc. C. E., extensive experience in teach-

ing; recognized authorship. Desires change of location. A-2670.

**CONSTRUCTION ENGINEER AND SUPER-INTENDENT**, M. Am. Soc. C. E.; age 47; married. Fifteen years' experience, general construction on design, estimating, planning, superintendence in full charge. Location, anywhere. B-3852.

**CHIEF ENGINEER**, M. Am. Soc. C. E., available. High-grade progressive chief engineer with thorough mechanical training, executive ability, and constructive record of results accomplished. B-3914.

**ENGINEER-SUPERINTENDENT**; age 37; married; civil engineer, Cornell, on subway foundation or other heavy construction. Experience also includes building and highways. Opportunity to organize and handle production as superintendent or assistant superintendent preferred. Available at once. Location preferred, New York City or vicinity. B-5937.

**CONSTRUCTION SUPERINTENDENT**, Jun. Am. Soc. C. E.; graduate civil engineer; age 28; single. Seven years' experience designing, estimating, superintending, building construction. Just completed superintending sixteen-story office building. Familiar with office buildings, apartments, and theatres. Available immediately. Location, Metropolitan District. B-6767.

**SALES OR PROMOTION ENGINEER**, Assoc. M. Am. Soc. C. E.; graduate civil engineer; age 32; single. Twelve years' continuous engineering experience. Construction work on railroads, roads, sewers, industrial plants, hydro-electric plant, flood-protection works. No selling experience, but firm conviction of ability to make sales. Available on reasonable notice. Location, preferably East or West Coast. B-6886.

**RESIDENT ENGINEER OR SUPERINTENDENT OF CONSTRUCTION**, Assoc. M. Am. Soc. C. E.; age 40; single. Twenty years' experience on construction work which includes two hydro-electric plants, one very large steam-electric plant, four small dwellings, three modern factory buildings, one hotel, sewer lines, water mains, and asphalt block paving, etc. Available at once. Location anywhere. B-6942.

**INSTRUCTOR**, Jun. Am. Soc. C. E.; age 31; single. Instructor for two years in mechanics of materials, theoretical hydraulics, surveying, elements of structures, drawing; architect and builder, two years; Inspector, construction, one year; Second Lieutenant, U. S. Army, two years. Interested in basket-ball; Varsity player, three years. Location preferred, New York. B-7193.

**CIVIL ENGINEER**, Assoc. M. Am. Soc. C. E., Graduate, Mass. Inst. Tech.; age 29; married. Six years' experience, now in responsible charge of structural engineering investigations for large corporation. Has had financial and technical supervision of Government surveys in United States, Panama, and Alaska. Broad experience in meeting people and discussing technical questions. Desires position involving engineering and sales. B-8955.

**ENGINEER OR SUPERINTENDENT**, Assoc. M. Am. Soc. C. E.; age 43; married. On design and superintendence, construction, railroad, and municipal work, bridges, and

buildings. Superintendence of construction preferred on salary with bonus based on saving. Location immaterial. B-9497.

**CONTRACTOR'S SUPERINTENDENT**, Assoc. M. Am. Soc. C. E., age 43; single. Twenty years' construction experience, railroad, roads, pavements, mill buildings, including beet-sugar mills and chemical plants. Thoroughly grounded in mechanical layouts. Can go anywhere. C-469.

**EXECUTIVE ENGINEER**, Superintendent Construction, Engineering Reports, etc., M. Am. Soc. C. E.; technical graduate; age 50; married. Experience in Scotland, England, United States, Canada, Mexico, Peru, Chile, Argentine, Uruguay. Docks, railway, water-works, harbor, bridge, canal, steel plant, power plants (steam and hydro-electric), general construction. Speaks, writes Spanish. Location preferred, British Dominions, Spanish-speaking country. C-496.

**RECENT CIVIL ENGINEER**, graduate; age 24; single. Capable of doing work in structural designing and detailing on steel and reinforced concrete structures, also work in hydraulic, sanitary, and highway engineering. Available at once. Location, preferably New York or Boston, Mass. C-1430.

**CONSTRUCTION, COMMERCIAL, OR APPRAISAL ENGINEER**, M. Am. Soc. C. E.; age 47; married. Sixteen years' experience heavy construction work, tunnel, subway, railroad, including estimating, costs, specifications. Seven years, organizing valuations, appraisals, including special reports and analyses. Four years, president, manufacturing and foundry business involving complete re-organization. Location immaterial. C-1690.

**DRAFTSMAN AND FIELD ENGINEER**; age 28; single. Has had six years' experience equally divided between the office and field. Available immediately. Location preferred, New York City. C-1893.

**CIVIL ENGINEER**, Assoc. M. Am. Soc. C. E.; graduate; age 37; registered. Fifteen years' experience, railway construction, highway location and construction, large real estate developments and sub-divisions, sewers. Field and office experience. Available immediately. Location, South. C-2153.

**CONSTRUCTION ENGINEER**, M. Am. Soc. C. E.; graduate; age 43; married. Well rounded experience, surveying, conveying machinery, structural steel, plate steel, bridges, foundations, reinforced concrete, sewers, dredging, pavements. Responsible charge, Government and private contracts. Estimating, designing, selling. Location, anywhere. Available at once. C-2169.

**RODMAN**; age 29; single. Has had one month as assistant to city surveyor and two months as assistant on sewer surveying, being rodmán, chainman, etc. Am familiar with logarithmic and trigonometric tables. Available now. Location preferred, New York City, or near-by. C-2384.

**DESIGNING ENGINEER OR DRAFTSMAN**; age 22; single. Draftsman and computer, competent in reinforced concrete or steel design, hydraulic or hydro-electric design.

Graduate of Massachusetts Institute of Technology, 1926, studied hydro-electric option of civil engineering course. Location preferred, New York City. C-2415.

**CIVIL ENGINEER**, Jun. Am. Soc. C. E.; age 28; single. Ambitious, willing young man who can design and inspect reinforced concrete, design and lay out structural steel, and lay out and survey trackwork. Available within two weeks. Location preferred, New York City. C-2431.

**CIVIL ENGINEER**; age 39; single. Field or office-field construction work, railroad valuation surveys, and railroad reconstruction; office valuation estimates, grading, maps, profiles, track layouts, and study of land from original deeds. Available now. Location preferred, New York City, Albany, or Schenectady, N. Y. C-2448.

**OIL REFINERY ENGINEER**, Assoc. M. Am. Soc. C. E.; age 34; married. Practical experience in atmospheric and cracking plants in still operation, pumping, treat-

ing, special operation problems, combustion, power plant operation, water supply, drainage, maintenance of equipment, design and construction of complete plants. Available on reasonable notice. Location, anywhere. C-2465-11-A-11.

**CIVIL ENGINEER**; married. Twelve years' experience, railroad survey and construction; highway construction; plant layout and construction for oil and gas storage; inspection, concrete work; some building experience. C-2510.

**ASSISTANT PROFESSOR OF CIVIL ENGINEERING**, Assoc. M. Am. Soc. C. E.; Harvard Univ., A. B.; Mass. Inst. Tech., S. B.; Univ. of Illinois, M. S.; age 31; married. Seven years' teaching experience, mechanics, strength of materials, hydraulics, undergraduate and graduate courses in structures, both steel and concrete. Office experience. Permanent position desired. Available June, 1927. Location, preferably New England or Middle Atlantic States. C-3142.

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## Membership

(From January 5 to February 1, 1927)

### Additions

		Date of Membership.
ANDERSON, Louis, Jr. Chemical Engr. and Chf. Chemist, Alpha Portland Cement Co. (Res., 129 Lafayette St.), Easton, Pa...	M.	Jan. 17, 1927
BANTA, Arthur Perry. California Inst. of Tech., Pasadena, Calif.	Jun.	Jan. 17, 1927
BEEBE, Harwood. Cons. Engr. (The Harwood Beebe Co.), Montgomery Bldg., Spartanburg, S. C.	M.	Jan. 17, 1927
BEGRISCH, Frank William. Constr. Supt., Realty Managers, Inc. (Res., 1794 Prospect Ave.), New York, N. Y.	Jun.	Jan. 17, 1927
BLAIR, Alexander. Civ. Engr. and Surv. (Res., 264 Dudley Ave.), Westfield, N. J.	Assoc. M.	May 7, 1913
BOASE, Arthur James. Prof., Civ. Eng., Pennsylvania Military Coll., Chester, Pa.	M.	Jan. 17, 1927
BRADLEY, Frances Gaylord. Staff Engr., Associated Gen. Contrs. of America, Inc., 115 Latta Arcade, Charlotte, N. C.	Assoc. M.	Mar. 7, 1921
BRONSTORPH, Frank Longden. Acting Asst. City Engr., Kingston & St. Andrew Corporation (Res., Coswold, South Camp Rd.), Kingston, Jamaica.	M.	Jan. 17, 1927
BROOKS, George Raymond. Constr. Engr., Famous Players-Lasky Corporation, 5451 Marathon St. (Res., 107 South Serrano Ave.), Los Angeles, Calif.	Assoc. M.	Nov. 15, 1926
BROWNE, Floyd Gilmore. Supt. and Chemist, Sewage Treatment Works (Res., 513 Delaware Ave.), Marion, Ohio.	Jun.	Jan. 17, 1927
BRUECKMANN, Frank George. With Burns & McDonnell Eng. Co., 402 Interstate Bldg. (Res., 1514 East 49th St. Terrace), Kansas City, Mo.	Assoc. M.	Oct. 1, 1926
BURGESS, Henry Russell. 6842 Thomas Boulevard, Pittsburgh, Pa.	Assoc. M.	Jan. 17, 1927
CASSADY, Jesse James. Res. Engr., State Highway Comm., Martinsville, Va.	Jun.	Oct. 1, 1926
CHANDLER, Elwyn Francis. Prof., Civ. Eng., and Dean, Coll. of Eng., Univ. of North Dakota, University, N. Dak.	Assoc. M.	Jan. 17, 1927
CHURCHILL, Robert Carr. Gen. Contr., 24 Mountain Ave., S. W., Roanoke, Va.	M.	Feb. 1, 1910
COLEMAN, Alexander Andrew Aloysius. Asst. Engr., State Div. of Highways, 512 Metropolitan Bldg., East St. Louis, Ill.	Assoc. M.	Jan. 17, 1927
COZZENS, John Lawrence. Asst. Engr., Reading Co., 2821 Richmond St. (Res., 5911 Webster St.), Philadelphia, Pa.	M.	Jan. 17, 1927
CURTIS, Benjamin John. Asst. Engr., San. Dist. of Chicago (Res. 1749 West 96th St.), Chicago, Ill.	Jun.	Sept. 2, 1914
DELAPLAINE, Henry. Chf. Engr., Keystone State Constr. Co., 300 Franklin National Bank Bldg., Philadelphia, Pa.	Assoc. M.	June 18, 1919
DOLAND, James Joseph. Asst. Prof., San Eng., Univ. of Illinois, 204 Eng. Hall, Univ. of Illinois, Urbana, Ill.	M.	Jan. 17, 1927
DRYDEN, Francis Henry. City Engr. and Chf. Engr., Salisbury Water and Sewer Comm., Salisbury, Md.	Assoc. M.	Jan. 17, 1927
DURRETT, Thomas Jackson, Jr. Estimator, A. J. Krebs Co., 409 Walton Bldg., Atlanta, Ga.	M.	Jan. 17, 1927
EBERHARDT, Walter Rudolph. Designer, The H. K. Ferguson Co., 4900 Euclid Ave. (Res., 9327 Amesbury Ave.), Cleveland, Ohio.	Jun.	Dec. 3, 1926
EDWARDS, James Leland. Chf. Engr., H. G. Balcom, 10 East 47th St., New York, N. Y. (Res., 196 Howard St., Passaic, N. J.)	Assoc. M.	Nov. 15, 1926
ELSENER, Lawrence Alois. Contr. Engr., Chicago Bridge & Iron Works, 338 Rialto Bldg., San Francisco, Calif.	Assoc. M.	Jan. 17, 1927
FLOYD, Harry Burdsall. Asst. Engr., Union Paving Co., 205 South 30th St., Philadelphia, Pa.	Assoc. M.	Jan. 17, 1927
GALVIN, Thomas Edward. 2132 Grove St., San Francisco, Calif.	Jun.	Jan. 17, 1927
GOLINSKI, Stephen William. Pres., Golinski Constr. Co., 420 South Grove St., Irvington, N. J.	Jun.	Mar. 12, 1923
HAUSER, Leon Aaron. Field Engr., B. & O. R. R., Philadelphia, Pa. (Res., 1603 Varnum St., N. W., Washington, D. C.)	Assoc. M.	Jan. 17, 1927
HAWLEY, Jean Hodgkins. Chf., Coast Pilot Section, U. S. Coast and Geodetic Survey, Washington, D. C.	Assoc. M.	April 25, 1921
HERTENSTEIN, Wesley. Draftsman, Pasadena Water Dept. (Res., 1768 Corson St.), Pasadena, Calif.	M.	Jan. 17, 1927
HOCH, Ralph William. 217 Green Ave., Lansdowne, Pa.	Jun.	Oct. 1, 1926
HOE, Thorolf Frederick. Montauk, N. Y.	Assoc. M.	Jan. 17, 1927
HOFTO, Glen Ellis. 213 East 6th St., Michigan City, Ind.	Jun.	July 12, 1926
	Jun.	Oct. 1, 1926

## MEMBERSHIP—(Continued)

		Date of Membership.
HOPE, Edward Swain. Mass. Inst. of Tech. Dormitory, Cambridge, Mass.	Jun.	Nov. 15, 1926
HOUSTON, Charles Wesley. 304 East Lemon Ave., Monrovia, Calif.	Jun.	Aug. 30, 1926
HOWE, Donald Wallis. Head, Elec. Eng. Dept., Billings Polytechnic Inst., 710 North 30th St., Billings, Mont.	Jun.	Oct. 1, 1926
KESSLER, William. Associate Engr., U. S. Geological Survey, San Francisco (Res., 844 Peralta Ave., Berkeley), Calif.	Assoc. M.	Aug. 30, 1926
KINZEY, Albert Freeman. 1089 East Ave., Akron, Ohio.	Jun.	Dec. 3, 1926
LANG, Oliver Howard. Cons. Engr., Moultrie, Ga.	M.	Jan. 17, 1927
LEVITT, Charles Arnold. In Chg., Eng. Dept., Pecker Iron Works (Res., 2995 Bedford Ave.), Brooklyn, N. Y.	Assoc. M.	Jan. 17, 1927
LEWIS, Isidore Leonard. Senior Draftsman, Dept. of City Transit, 1211 Chestnut St. (Res., 2154 North 21st St.), Philadelphia, Pa.	Assoc. M.	Jan. 17, 1927
LEWIS, Lawrence Bosler. 8309 York Rd., Elkins Park, Pa.	Jun.	Jan. 17, 1927
LOWE, Walter Edgar. 1231 Joseph Ave., Nashville, Tenn.	Jun.	Jan. 17, 1927
MACDONALD, Alexander. Chf. Engr., Keystone Coal & Coke Co., Huff Bldg., Greensburg, Pa.	M.	Jan. 17, 1927
MCDONALD, Charles Neil. Vice-Pres., The Gilpin Constr. Co., 331 Worcester Bldg., Portland, Ore.	M.	Jan. 17, 1927
MCGLASHON, Don Walker. Sales Engr., Am. Steel & Wire Co., 506 Olive St., Room 1511, St. Louis, Mo.	Jun.	Oct. 1, 1926
MCNEIL, Donald Miller. 1414 Rockland Ave., Beechview, Pittsburgh, Pa.	Jun.	Jan. 17, 1927
MARS, Edward Wellington. R. F. D. No. 2 Sapulpa, Okla.	Jun.	Jan. 17, 1927
MEBUS, George Brinker. Asst. to Albright & Mebus, 37 Easton Rd., South (Res., 217 North Easton Rd.), Glenside, Pa.	Jun.	Jan. 17, 1927
METCALFE, Alfred Harold. Mgr., Masonry Constr., Stewart & Bennett, Inc., 126 North Water St., Rochester, N. Y.	Assoc. M.	Mar. 13, 1917
MILLER, Alfred Frederick Jensen. Chf. Structural Engr., Los Angeles Bldg. Dept., 139 North Sunset Pl., Monrovia, Calif.	M.	Jan. 17, 1927
MOODIE, Robert Wardwell. Draftsman, Am. Bridge Co. (Res., 539 Maplewood Ave.), Ambridge, Pa.	Assoc. M.	Jan. 17, 1927
MOORE, Chester Ewing. Chf. Engr., Marland Oil Co., 100 South Osage, Ponca City, Okla.	Jun.	Nov. 15, 1926
MORGAN, Newlin Dolbey. Asst. Prof., Architectural Eng., Univ. of Illinois (Res., 205 Iowa St.), Urbana, Ill.	Assoc. M.	Nov. 15, 1926
MORRIS, Charles Chester. Highway Engr., U. S. Bureau of Public Roads, 461 Market St., San Francisco, Calif.	Assoc. M.	Dec. 3, 1911
O'CONNOR, James John. Field Engr., Jobson Gifford Co., 441 Lexington Ave., New York (Res., 60 Main St., Hastings-upon-Hudson), N. Y.	M.	Dec. 3, 1926
OWEN, William Victor. Structural Detailer-Draftsman, Turner Constr. Co. (Res., 28 Tremaine Ave., Kenmore), Buffalo, N. Y.	Assoc. M.	Nov. 15, 1926
PAINE, Clifford Emmett. Designing Engr., The Strauss Bascule Bridge Co., 307 North Michigan Ave., Room 1414, Chicago, Ill.	Jun.	Oct. 1, 1926
PEI, I-Hsiang. Dist. Mgr. and Engr., China Industry Development Corporation, 4 San Wei Rd. Mukden, China.	M.	Jan. 17, 1927
PETERSON, Alden William. Chf. of Party, Stone & Webster, Inc., Boston, Mass. (Res., 425 West End Ave., New York, N. Y.)	Jun.	Nov. 9, 1920
POWELL, Willis Mavnor. Engr. and Supt., West Texas Constr. Co., 504 Cotton Exchange Bldg., Fort Worth, Tex.	Assoc. M.	Nov. 15, 1926
PUNYAGUPTA, Soonchong Boon. Asst. Engr., Technical Service, Royal State Rys. of Siam, 5077 Plab Pla Chai Rd., Bangkok, Siam.	Jun.	Oct. 1, 1926
RAAB, Norman Cecil. Asst. Designing Engr., Bridge Dept., State Highway Comm., Sacramento (Res., 1119 East Main St., Stockton), Calif.	Jun.	June 19, 1922
RADY, Joseph. Box 1, Clarendon, Tex.	Assoc. M.	Nov. 15, 1926
RETZ, Rolf Tornsgaard. Bridge Designer, State Highway Comm., Jersey City (Res., 102 West 37th St., Bayonne), N. J.	Assoc. M.	Jan. 17, 1927
RICHARDS, John Morgan. 528 Bennie Dillon Bldg., Nashville, Tenn.	Jun.	Oct. 1, 1926
SANTOS, Adolpho, Jr. Asst. Engr., The São Paulo Tramway Light & Power Co., Ltd., Serra Development, Caixa Postal A, São Paulo, Brazil.	Assoc. M.	Jan. 17, 1927
SCOTT, Cladius Bernard. Care, Carolina Steel & Iron Co., Greensboro, N. C.	Jun.	Nov. 15, 1926
SEAMAN, William Laurie. (E. W. Bell & Seaman), 26 Bridge St., Sydney, New South Wales, Australia.	Jun.	Oct. 1, 1926
SEASWORD, Carl Gottfred. Junior Structural Engr., City Engr.'s Office, City Hall (Res., 2090 Euclid Ave., West) Detroit, Mich.	Jun.	Oct. 14, 1919
SHAW, John Claude. City Engr., Room 400, South Annex, City Hall, Los Angeles, Calif.	Assoc. M.	Nov. 15, 1926
	M.	Jan. 17, 1927

## MEMBERSHIP—(Continued)

		Date of Membership.
SHINKAI, Tsuguo.	3313 Hanford St., Seattle, Wash.	Jun. Oct. 1, 1926
SHUMAN, Jesse Wyman.	Secy-Treas., The Elliott Co. of Minneapolis, 621 Met. Life Bldg., Minneapolis, Minn.	M. Nov. 15, 1926
SIBBERT, Edward Frederick.	Archit. and Engr. (Pancoast & Sibbert), 1139 Lincoln Rd., Miami Beach, Fla.	Assoc. M. Jan. 17, 1927
SLOAN, Norton Quincy.	Secy. and Constr. Mgr., Frank Hill Smith, Inc., 14 East 2d St., Dayton, Ohio.	Assoc. M. Aug. 31, 1915
SMITHEY, Louis Philippe.	Archit. and Engr. (Smithey & Tardy), 112 Kirk Ave., West, Roanoke, Va.	M. Dec. 3, 1926
SPORRY, Ernest.	Care, E. J. Albrecht, 35 South Dearborn St., Chicago, Ill.	M. Jan. 17, 1927
STEIN, Aaron.	Structural Engr., V. D. Simons, Tribune Tower (Res., 3214 Crystal St.), Chicago, Ill.	Assoc. M. Aug. 30, 1926
STEVENS, George William.	Draftsman, City of Santa Barbara Eng. Dept. (Res., 920 East Haley St.), Santa Barbara, Calif.	Assoc. M. Nov. 15, 1926
STOKES, Camillus Baker.	Asst. to Chf. Draftsman, State Highway Comm. (Res., 1005 East 18th St.), Oklahoma City, Okla.	Jun. Jan. 17, 1927
STOLDT, Clarence Alfred.	Asst. City Engr., Blackwell, Okla.	Assoc. M. July 12, 1926
THATCHER, Romeyn Yatman.	Asst. Prof., Civ. Eng., Cornell Univ. (Res., 962 East State St.), Ithaca, N. Y.	Jun. Nov. 15, 1926
THOMPSON, Philip West.	Draftsman and Surv., The Southern Sierras Power Co., 98 Somerset Drive, Riverside, Calif.	M. Nov. 15, 1926
TIPPET, Henry Jackson.	Div. Engr., The Connecticut Co. (Res., 120 Westwood Rd.), New Haven, Conn.	Jun. Jan. 17, 1927
TORPEN, Alex M.	Care, Wynooche Water and Power Project, 417 Becker Bldg., Aberdeen, Wash.	Assoc. M. Mar. 4, 1914
VAN TREES, John Ellis, Jr.	Res. Engr., T. H. Allen (Res., 250 South Waldran Boulevard), Memphis, Tenn.	M. Jan. 17, 1927
WALDROP, John Douglas.	Asst. State Highway Engr., State Highway Comm., Raleigh, N. C.	Assoc. M. Oct. 7, 1914
WALTER, Carl Emil.	Care, Turner Constr. Co., 205 South St., New York, N. Y.	M. Oct. 1, 1926
WEAVER, Herbert Lee.	Office Engr. and Asst. Chf. Engr., The Roland Park Co., Roland Park (Res., 542 East 38th St.), Baltimore, Md.	Assoc. M. Nov. 15, 1926
WEAVER, Russell Reiss.	Y. M. C. A., Pottstown, Pa.	Jun. Dec. 3, 1926
WEIDEMANN, Einar.	Structural Engr. and Engr. of Bldgs. and Structures, Chicago Union Station Co., Union Station Bldg., Chicago, Ill.	M. Jan. 17, 1927
WILKIN, Philip.	Field Engr. and Solicitor, New York Reciprocal Underwriters, 1 Park Ave., Room 1614, New York, N. Y.	Jun. Jan. 17, 1927
WIRTH, Walter Ferdinand.	Asst. Engr., R. W. Hebard & Co., 15 Avenida Norte No. 7, San Salvador, Salvador.	Jun. Mar. 12, 1923
WOLFE, Henry.	Squad Leader, Elec. Bond & Share Co., 65 Broadway, New York (Res., 2225 Ocean Ave., Brooklyn), N. Y.	Assoc. M. Dec. 3, 1926
WOLFE, Joseph Marion.	915 Second Ave., Opelika, Ala.	Jun. Dec. 3, 1926
YOUNG, George Richmond.	Asst. Engr., Sewerage Comm., 1068 Murray Ave., Milwaukee, Wis.	Assoc. M. Jan. 19, 1920
		M. Jan. 17, 1927

## Reinstatements

## MEMBERS

Date of  
Reinstatement.

GOWDY, Roy Cotsworth.	Jan. 31, 1927
LEEFE, Frederick Ewbank.	Jan. 17, 1927
ROSS, Douglas William.	Jan. 17, 1927

## ASSOCIATE MEMBERS

DOYEN, George Evelyn.	Jan. 17, 1927
MOSS, Castle Prentice.	Jan. 17, 1927

## Resignations

## MEMBERS

Date of  
Resignation.

BURRAGE, John Otis.	Jan. 17, 1927
MOORE, Charles Gillingham.	Jan. 17, 1927

	Date of Resignation.
<b>ASSOCIATE MEMBERS</b>	
HALL, Howard Washington.....	Jan. 17, 1927
KLINGBERG, Emanuel Carl Hjalmar.....	Jan. 17, 1927
MEYER, Hans Gottfried.....	Jan. 17, 1927
TEETER, Thomas Anderson Hendricks.....	Jan. 17, 1927
WILCOX, Frank Day.....	Jan. 17, 1927
YOUNG, Charles Newton.....	Jan. 17, 1927

### Deaths

BULKELEY, Oscar Ernest. Elected Associate Member, October 9, 1917; died January 4, 1927.  
 BURCHARD, Anson Wood. Elected Associate Member, May 3, 1893; died January 22, 1927.  
 CLIFFORD, Walter Woodbridge. Elected Junior, November 8, 1909; Associate Member, January 15, 1917; Member, March 16, 1925; died January 19, 1927.  
 HARRISON, William Burr. Elected Member, April 30, 1912; died October 20, 1926.  
 LYONS, Harold Chandos. Elected Associate Member, July 9, 1912; died December 30, 1926.  
 PATTERSON, John Curtis. Elected Member, October 2, 1889; died January 6, 1927.  
 PROUT, Henry Goslee. Elected Affiliate, November 6, 1872; Member, September 3, 1879; died January 26, 1927.  
 SUMNER, Horace Augustus. Elected Member, October 4, 1899. died December 31, 1926.

### Total Membership of the Society, February 1, 1927

Members .....	5 234
Associate Members.....	5 507
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Corporate Members .....	10 741
Honorary Members .....	14
Juniors .....	1 163
Affiliates .....	148
Fellows .....	8
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Total.....	12 074